Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates broadly to polishing articles such as pads for electrochemical mechanical polishing (ECMP), and more particularly to such articles which are formed of a layer of an electrically-conductive compound formulated as an admixture of a polymeric binder and an electrically-conductive filler.

[0002] In the general mass production of semiconductor devices, hundreds of identical "integrated" circuit (IC) trace patterns may be fabricated in several layers on a semiconducting wafer substrate which, in turn, is cut into hundreds of dies or chips. Within each of the die layers, the circuit traces, which are formed of a conductive material such as copper, aluminum, titanium, tantalum, iron, silver, gold, a conductively-doped semiconducting material, or the like, may be isolated from the next layer by an insulating material.

[0003] The fabrication of the IC trace patterns on the wafer thus may involve the deposition and removal of multiple layers of conducting, semiconducting, and/or dielectric materials. As the layers of these materials each is sequentially deposited and removed, the surface of the wafer may become relatively nonplanar. In order to assure the accuracy of the deposition and removal operations, and, ultimately, the performance of the semiconductor device, it is necessary to polish the layers to a smooth surface topography or, as is termed in the verbiage, a high degree of planarization, the terms "polish" and "planarize" often being used interchangeably, and are so used herein. In this regard, a relatively rough surface topography may be manifested as a depth of field problem resulting in poor resolution of the patterns of subsequently deposited layers, and, in the extreme, in the short circuiting of the device. As circuit densities in semiconductor dies continue to increase, any such defects become unacceptable and may render the circuit either inoperable or lower its performance to less than optimal.

[0004] To achieve the relatively high degree of planarity required for the production of substantially defect free IC dies, a chemical-mechanical polishing (CMP) process has been routinely practiced. Such process involves chemically etching the wafer surface in combination with mechanical polishing or grinding. This combined chemical and mechanical action allows for the controlled removal of material and the polishing, i.e., planarizing, of the wafer.

[0005] In essential operation, CMP is accomplished by holding the semiconductor wafer against a rotating polishing surface, or otherwise moving the wafer relative to the polishing surface, under controlled conditions of temperature, pressure, and chemical composition. The polishing surface, which may be a planar pad formed of a relatively soft and porous material such as a blown polyurethane, is wetted with a chemically reactive and abrasive aqueous slurry. The aqueous slurry, which may be either acidic or basic, typically includes abrasive particles, a reactive chemical agent such as a transition metal chelated salt or an oxidizer, and adjuvants such as solvents, buffers, and passivating agents. Within the slurry, the salt or other agent provides the chemical etching action, with the abrasive particles, in cooperation with the polishing pad, providing the mechanical polishing action.

[0006] An abrasive also may be incorporated into the pad itself, such pads being termed "fixed abrasive" pads. When used in conjunction with these fixed abrasive pads, the slurry may provide additional abrasive or, alternatively, with the abrasive being supplied only by the pad, the slurry may be provided instead as a substantially abrasive-free solution. For the purposes of the present description, however, the terms "slurry" and "solution" may be used interchangeably unless otherwise indicated.

[0007] The basic CMP process is further described in the articles Derbyshire, K., "Making CMP Work," Semiconductor Magazine, pp. 40-53, July 2002; "The Semiconductor Equipment Business," Prismark Partners LLC, Cold Spring Harbor, NY, March 2002; and "CMP," Prismark Partners, LLC, Cold Spring Harbor, NY, November 2000, and in the following U.S. Patent Nos.: 5,709,593; 5,707,274; 5,705,435; 5,700,383; 5,665,201; 5,658,185; 5,655,954; 5,650,039; 5,645,682; 5,643,406; 5,637,185; 5,618,227; 5,607,718; 5,607,341; 5,597,443; 5,407,526; 5,395,801; 5,314,843; 5,312,785; and 5,084,071. Polishing pads are further described in the following references: U.S. Patent Nos. 3,760,637; 4,198,739; 4,462,188; 4,588,421; 4,728,552; 4,752,628; 4,841,680; 4,927,432; 4,959,113; 4,964,919; 5,200,833; 5,257,478; 5,264,010; 5,329,734; 5,382,272; 5,389,352; 5,476,606; 5,480,476; 5,487,697; 5,489,233; 5,534,053; 5,578,362; 5,605,760; 5,624,303; 5,645,474; 5,664,989; 5,693,239; 5,707,492; 5,738,567; 5,738,800; 5,769,689; 5,770,103; 5,795,218; 5,823,855; 5,860,848; 5,876,266; 5,879,222; 5,882,251; 5,900,164; 5,913,713; 5,932,486; 5,938,801; 5,976,000; 5,989,470; 6,001,269; 6,017,265; 6,019,666; 6,022,264; 6,022,268; 6,030,899; 6,036,579; 6,042,741; 6,054,017; 6,062,968; 6,099,080; 6,071,178; 6,074,546; 6,093,649; 6,095,902; 6,099,394; 6,099,954; 6,106,754; 6,117,000; 6,120,366; 6,126,532; 6,132,647; 6,143,662; 6,174,227; 6,159,088; 6,165,904; 6,168,508; 6,171,181; 6,179,950; 6,210,254; 6,210,525; 6,217,418; 6,217,434; 6,218,305; 6,231,434; 6,238,271; 6,241,586; 6,245,679; 6,261,168; 6,267,659; 6,277,015; 6,284,114; 6,287,174; 6,287,185; 6,293,852; 6,293,852; 6,293,852; 6,314,434; 6,315,645; 6,315,857; 6,319,370; 6,325,703; 6,332,832; 6,346,032; 6,354,915; 6,358,130; 6,358,854; 6,364,749; and 6,375,559; U.S. Patent Application Publication Nos. 2001/000497; 2001/0024878; 2001/0031610; 2001/0031615; and 2002/0026646; European Patent Nos. 0,919,330 and 1,112,816; International Application Nos. WO 98/47662; WO 00/02707; WO 00/17129; WO 01/19567; WO 01/24969; WO 01/49449 and WO 02/13248; and Patent Abstracts of Japan Nos. 0728944; 11055246; 10055684; 2000134529; 09305885; 09305884; 11040226; 2000153142;
Looking to Fig. 1, a representative CMP process and apparatus are illustrated schematically at 10. The apparatus 10, which is illustrated to be of a "rotational"-type, includes a wafer carrier, 12, for holding a semiconductor wafer or other workpiece. A polishing pad, 16, is positioned between wafer carrier 12 and wafer 14, with the wafer being held against the pad by a partial vacuum, frictionally, or with an adhesive. Wafer carrier 12 is provided to be continuously rotated by a drive motor, 18, in the direction referenced at 20, and additionally may be reciprocated transversely in the directions referenced at 22. In this regard, the combined rotational and transverse movements of the wafer 14 are intended to reduce the variability in the material removal rate across the work surface 23 of the wafer 14.

Apparatus 10 additionally includes a platen, 24, which is rotated in the direction referenced at 26, and on which is mounted a polishing pad, 28. As compared to wafer 14, platen 24 is provided as having a relatively large surface area to accommodate the translational movement of the wafer on the carrier 12 across the surface of the polishing pad 28.

A supply tube, 30, is mounted above platen 26 to deliver a stream of polishing slurry, referenced at 32, which is dripped or otherwise metered onto the surface of pad 28 from a nozzle or other outlet, 34, of the tube 30. The slurry 32 may be gravity fed from a tank or reservoir (not shown), or otherwise pumped through supply tube 30. Alternatively, in an "orbital" variant of apparatus 10, slurry 32 may be supplied from below platen 26 such that it flows upwardly from the underside of polishing pad 28 and through holes which may be formed in the pad 28. Apparatus 10 also may be provided to be of a continuous belt-type.

Increasingly, the planarization of the surfaces of the metal layers deposited on the wafer is assisted by the use of an electrolytic polishing slurry or solution by means of a process known as electrochemical mechanical planarization (ECMP). With continuing reference to Fig. 1, a deposited metal layer of the wafer 14, which layer may be considered for present purposes to be the work surface 23, the electrolytic slurry or solution 32, and a cathode electrode, 40, which is coupled to or otherwise in contact with the pad 28, are connected to a voltage potential source, 42, to complete an electrochemical circuit or cell, referenced at 44. With a bias applied between the cathode 40 and the surface 23, material in the form of metal ions may be removed by the disassociative oxidation from the surface 23 which functions as an anode in the circuit 44. These ions, which dissolve or otherwise into the slurry 32, then may either plate at the cathode 40 or be washed away with the slurry. The rate at which the material is removed generally is determined by the control of such system parameters as the concentration of electrolyte in the slurry 32 and the voltage potential applied by the source 42. The ECMP process is further described in the following references: U.S. Pat. Nos. 6,482,307; 6,379,223, 6,368,190, 6,299,741, 5,911,619, and 5,807,165; U.S. 2002/0102853; WO 02/085570, 02/075804, 02/084714, 01/71796, and 01/63018; and EP 1,103,346.

It has been observed, however, that when utilized in ECMP tools or systems, conventional polishing pads, which typically are formed of non-electrically conductive materials, may interfere with the application of the bias to the work surface. The result is a non-uniform or variable dissolution of material from the work surface. Accordingly, it is believed that improved conductive polishing pads would be well-received by the semiconductor manufacturing industry. Especially desired would be a pad offering improved performance life when used in ECMP tools or systems.

US 2002/0119286 describes an article of manufacture and apparatus for planarizing a substrate surface. The polishing article includes a body having at least a partially conductive surface adapted to polish the substrate and a mounting surface. Another polishing article that is described in this document for polishing a substrate includes a body having a polishing surface and a conductive element disposed therein. A conductive polishing material described in this document includes conductive polymers. This document describes providing a conductive polishing material as a polishing layer disposed on a conventional, dielectric, polishing material as a support layer. This document also describes conductive polishing materials that include conductive fillers or conductive doping materials disposed in a binder material.

EP-A-1 361 023 forms part of the state of the art in accordance with Article 54(3) EPC. EP-A-1 361 023 describes an article of manufacture, method, and apparatus for planarizing a substrate surface. An article of manufacture is provided for polishing a substrate including a polishing article having a body comprising at least a portion of fibers coated with a conductive material, conductive fillers, or combinations thereof, and adapted to polish the substrate. Another polishing article that is described in this document includes a body having a surface adapted to polish the substrate and at least one conductive element embedded in the polishing surface, the conductive element comprising dielectric or conductive fibers coated with a conductive material, conductive fillers, or combinations thereof.

**BROAD STATEMENT OF THE INVENTION**

Aspects of the invention are defined in the accompanying claims.

According to an embodiment of the invention, there can be provided polishing articles such as pads for electrochemical mechanical polishing (ECMP). According to an embodiment of the invention, there can be provided articles which are formed of a layer of an electric-
cally-conductive compound formulated as an admixture of a polymeric component which forms a continuous phase in the layer, and an electrically-conductive filler component which forms a discrete phase within the continuous phase. Advantageously, pads provided in accordance with an embodiment of the invention can exhibit generally stable physical and electrical properties, and, in addition, increased durability and improved service life. In accordance with an embodiment of the invention, the compound is formulated to exhibit an overpotential for the activation of the reduction of water, or of another electrochemical reaction, within the electrochemical cell or circuit. That is, with the layer of the pad or other shaped article being electrically connected to a wafer or other workpiece, and with an electrical bias being applied between the workpiece and the pad, and the bias being capable of activating an electrochemical reaction, the compound exhibits an overpotential for the activation of the reaction such that the potential thereof is preferably greater than the bias.

As further described, for example, in U.S. Pat. Nos. 5,882,723; 4,882,024; and 4,765,874, for electrolysis or electrodeposition processes, such as ECMP, performed with the evolution, for example, of oxygen at one of the electrodes and hydrogen at the other, the actual voltage or potential required to activate the hydrolysis reaction is known to be greater than the theoretical voltage which may be calculated based on thermodynamic data. The difference between the higher and the theoretical voltage, which difference is often termed "overvoltage" or "overpotential," must be applied in order to overcome the various inherent resistances within the given electrochemical cell. Most often, electrodes which exhibit a low overpotential are desired as it is known that a reduction in the amount of applied overvoltage represents a significant savings of the energy costs associated with the operation of the cell.

In the present application, however, it has been discovered that polishing pads which are formed of a material exhibiting a relatively high overpotential are most desired for ECMP processes. In this regard, it is believed that current flow through the pad under the applied bias proceeds through the evolution, for example, and as depending upon the composition of the electrolytic solution which is employed, of hydrogen and oxygen gas, and is accompanied by the gradual deterioration of the material of the pad. With, for example, oxygen evolution occurring at the cathode electrode which is coupled to the pad, it is speculated that the deterioration of the pad material is related to the current flux which activates the oxygen evolution reaction, and that the reduction in the current will result in less degradation of the pad material, more uniform physical and electrical properties, and an increase in service life. Regarding the voltage flux, the growth of oxygen bubbles on the surface of the electrode and pad decreases the area thereof which is in contact with the electrolytic solution, and thereby causes the current density to increase. It is believed that this increase in current density, with a given current flowing through a smaller surface area, increases the deterioration of the pad material. Empirical observations have confirmed that the more stable pad materials have higher overpotential for the evolution of oxygen. For example, with the theoretical thermodynamic potential difference required to hydrolyze water into hydrogen and oxygen being given as about 1.23 volts versus the normal or standard hydrogen electrode, materials, or more precisely the electrically-conductive filler in those materials, having an overvoltage, such as at least about 1 volt, i.e., a potential for the electrolysis of water at about 2.25 volts, are believed would exhibit the stability which would be required for many ECMP pad applications.

Embodiments of the invention, accordingly, comprises the article, system, and method possessing the composition, combination of elements, and arrangement of parts and steps which are exemplified in the detailed disclosure to follow. Advantages of embodiments of the present invention include electrically-conductive polishing pads and other shaped articles for electrochemical mechanical polishing (ECMP) which afford stable physical and electrical properties with increased durability and improved service life. Moreover, although the polishing pads according to an embodiment of the invention may provide some polishing or planarization when used without bias, the pads can advantageously exhibit a large, e.g., 2X or more, improvement in polishing or planarization rate when used with a bias. Indeed, its has been observed that for more optimal bias performance, the pad may be formulated as described herein such that its non-basis planarization rate is relatively low.

These and other advantages will be readily apparent to those skilled in the art based upon the disclosure contained herein.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

Fig. 1 is a schematic view of a representative process for the CMP of a wafer, and as modified for the ECMP of such wafer;
Fig. 2 is an isometric view of a representative polishing pad in accordance with the present invention;
Fig. 3 is a magnified cross-sectional view of the polishing pad of Fig. 2 taken through line 3-3 of Fig. 2; and
Fig. 4 is an empirically-derived plot depicting standardized current-voltage curves comparing the overpotential of representative fillers for the compounds of the polishing articles of the present invention.

The drawings will be described further in connection with the following Detailed Description of the In-
DETAILED DESCRIPTION OF THE INVENTION

[0024] Certain terminology may be employed in the following description for convenience rather than for any limiting purpose. For example, the terms “forward” and “rearward,” “front” and “rear,” “right” and “left,” “upper” and “lower,” “top” and “bottom,” and “right” and “left” designate directions in the drawings to which reference is made, with the terms “inward,” “inner,” “interior,” or “inboard” and “outward,” “outer,” “exterior,” or “outboard” referring, respectively, to directions toward and away from the center of the referenced element, the terms “radial” or “vertical” and “axial” or “horizontal” referring, respectively, to directions or planes perpendicular and parallel to the longitudinal central axis of the referenced element. Terminology of similar import other than the words specifically mentioned above likewise is to be considered as being used for purposes of convenience rather than in any limiting sense.

[0025] In the figures, elements having an alphanumerical designation may be referenced herein collectively or in the alternative, as will be apparent from context, by the numeric portion of the designation only. Further, the constituent parts of various elements in the figures may be designated with separate reference numerals which shall be understood to refer to that constituent part of the element and not the element as a whole. General references, along with references to spaces, surfaces, dimensions, and extents, may be designated with arrows or underscores.

[0026] For the illustrative purposes of the discourse to follow, the polishing article of the present invention is described in connection with its configuration as a pad for use within the apparatus 10 of Fig. 1. It will be appreciated, however, that aspects of the present invention, which may be provided in other shapes, and in forms other than pads such as rolls, sheets, or belts, may find use in other tools or systems. Such alternative shapes and forms therefore should be considered to be expressly within the scope of the present invention.

[0027] Referring then to the figures wherein corresponding reference characters are used to designate corresponding elements throughout the several views in accordance with the present invention is shown generally at 50 in perspective in Fig. 2 and in cross-section in Fig. 3. With momentary reference again to Fig. 1, as used, for example, as the pad 16 within the apparatus 10, article 50 may be electrically coupled to the cathode electrode 40, and further may be connected electrically to the surface 23 via the electrolytic solution 32, which may be non-abrasive, and/or via direct contact therewith so as to complete the electrochemical cell 44. With additional reference to Figs. 2 and 3, in this regard, article 50 is provided as having a generally planar planar pol-
copper, Ferrex® (Parker Chomerics, Woburn, MA) tinplated copper-clad steel, tin-clad copper, and tin-plated phosphor bronze. Representative non-conductive fibers include cotton, wool, silk, cellulose, polyester, polyamide, nylon, and polyamide monofilaments or yarns which are plated, clad, or otherwise coated with an electrically-conductive material which may be a metal such as copper, nickel, silver, aluminum, tin, or an alloy or combination thereof, or a non-metal such as carbon, graphite, or conductive polymer, thereof. As is known, the plating, cladding, or other coating may be applied to individual fiber strands or to the surfaces of the fabric after weaving, knitting, or other fabrication. Combinations such as of one or more of the foregoing conductive fibers, one or more of the foregoing coated non-conductive fibers, and one or more of the foregoing coated non-conductive fibers and one or more of the foregoing coated non-conductive fibers also may be employed.

[0032] Inssofar as fabrics and cloths may find particular application, a preferred fabric construction for carrier 62 may be a non-woven, 9 mil (0.23 mm) thick, 2.6 oz/yd² (87 g/m²) weight, copper-plated pin bonded nylon (PBN), and between about 0.5-10% by weight, based on the total fabric weight, of the copper plating. As may be seen in Fig. 3, in the case of fabrics, cloths, screens, and other meshes or materials having at least some degree of porosity, the layer 60 may partially or, as shown, substantially completely impregnate the carrier 62 through to the surface 54 of the article 50. The layer 60 may be coated on, bonded to, or otherwise joined to, or incorporated in, and made integral with a sheet or other layer of the carrier 62 to provide, as shown, the laminar structure of article 50.

[0033] The electrically-conductive compound of the first layer 20 may be formulated in accordance with the precepts of the present invention as a blend or other admixture of a resin or other polymeric component, and an electrically-conductive, particulate fillers. The polymeric component, which itself may be a blend or other admixture, may be a thermoplastic or thermoset, and specifically may be selected as depending upon one or more of operating temperature, hardness, chemical compatibility, resiliency, compliancy, compression-deflection, compression set, flexibility, ability to recover after deformation, modulus, tensile strength, elongation, force deformation, flammability, or other chemical or physical property with, particularly, a hardness of between about 15-75 Shore D being considered preferred for many applications. Depending upon the application, suitable materials may include, particularly, polyurethanes, as well as silicones, fluoro-silicones, polycarbonates, ethylene vinyl acetates (EVA), acrylonitrile-butadiene-styrenes (ABS), polysulfones, acrylics, polyvinyl chlorides (PVC), polyphenylene ethers, polystyrenes, polyamides, nylons, polyolefins, poly(ether ether ketones), polyimides, polyetherimides, polybutylene terephthalates, polylethylene terephthalates, fluoropolymers, polyesters, acetals, liquid crystal polymers, polymethylacrylates, polyphe-
ly may be selected as depending upon one or more of conductivity, lubricity, resin demand, hardness, chemical compatibility, such as with the polymeric component and/or the material of the work surface 23 (Fig. 1), and cost.

[0037] Particularly in the case of the layer 23 (Fig. 1) being formed of copper, tin or graphite powders or other particles, or a mixture thereof, may be preferred. In this regard, it generally may be preferred, at least in the case of the processing surface 52 of the article 50 being in polishing contact the work surface 23 (Fig. 1) of the wafer, that the material of the filler 72 be provided as being softer, or at least not appreciably harder, than the material of the work surface 23 so as to minimize any potential for scratching or otherwise causing damage to the work surface. By way of example, the copper of the work surface 23 may have a Moh’s hardness of between about 2.5-3, with the tin and graphite filler particles having a Moh’s hardness of between about 1.5-1.8 for tin, and between about 0.5-1 for graphite.

[0038] Additional fillers and additives may be included in the formulation of the compound depending upon the requirements of the particular application envisioned. Such fillers and additives, which may be functional or inert, may include ceramic or other fixed abrasive particles, wetting agents or surfactants, pigments, dispersants, dyes, and other colorants, opacifying agents, foaming or anti-foaming agents, anti-static agents, coupling agents such as titanates, chain extending oils, tackifiers, flow modifiers, pigments, lubricants such as molybdenum disulfide (MoS₂), silanes and peroxides, such as Varox® (R.T. Vanderbilt Co., Inc., Norwalk, CT), dibenzylperoxide, dicumylperoxide, or other organic or inorganic peroxides, film-reinforcing polymers and other agents, stabilizers, emulsifiers, antioxidants, thickeners, and/or flame retardants and other fillers such as aluminum trihydrate, antimony trioxide, metal oxides and salts, intercalated graphite particles, phosphate esters, decabromodiphenyl oxide, borates, phosphates, halogenated compounds, glass, silica, which may be fumed or crystalline, silicates, mica, and glass or polymeric microspheres. Typically, these fillers and additives are blended or otherwise admixed with the formulation, and may comprise between about 0.05-80% or more by total volume thereof.

[0039] In accordance with one aspect of the present invention, the admixture of the compound additionally may comprise a resin filler component. With reference again to the somewhat stylized morphological, i.e., photomicrographical, depiction of article 50 shown in Fig. 3, the resin filler forms a second dispersed phase subsisting as discrete domains, one of which is referenced at 74, within the continuous phase 70, but as distinguished from the phase 70 by the absence, or substantial absence, of electrically-conductive filler particles 72 or other fillers which could act as substantial abrasives against the work surface 23 (Fig. 1) of the wafer. The domains 74 may have a major diametric or other extent, referenced at “d” in Fig. 3, of between about 0.08-2 mils (2-50 μm) and, depend upon the degree of dispersion within the matrix phase 70 and the particle size of the constituent charge, such domains 74 may be formed of individual resin particles or of agglomerations of such particles. As used herein, the term “discrete domains” should be understood to refer to either such domains either as particles or to agglomerations thereof.

[0040] The resin filler component, which, like the polymeric component, may be a blend or other admixture, may be a thermoplastic or thermoset, and again specifically may be selected as depending upon one or more of operating temperature, hardness, chemical compatibility, resiliency, compliancy, compression-deflection, compression set, flexibility, ability to recover after deformation, modulus, tensile strength, elongation, force deflection, flammability, or other chemical or physical property with, particularly, a hardness of between about 15-75 Shore D being considered preferred for many applications. Depending upon the application, the resin filler component and the polymeric component may be of the same composition, or of different composition. Suitable materials for the resin filler component thus may include, particularly, polyurethanes, as well as silicones, fluoro-silicones, polycarbonates, ethylene vinyl acetates (EVA), acrylonitrile-butadiene-styrenes (ABS), polysulfones, acrylics, polystyrenes, ethylenes, polyamides, polystyrenes, polyolefins, poly(ether ketone) polyimides, polyetherimides, polybutylene terphthalates, polyethylene terphthalates, fluoropolymers, polystyrenes, acetals, liquid crystal polymers, polyethylene oxides, polyolefins, epoxies, phenolics, chlorosulfonates, polybutadienes, butyl, neoprenes, nitriles, polysisoprenes, natural rubbers, and copolymer rubbers such as styrene-isoprene-styrenes (SIS), styrene-butadiene-styrenes (SBS), ethylene-propylenes (EPR), ethylene-propylene-diene monomers (EPDM), nitrile-butadienes (NBR), and styrene-butadienes (SBR), and copolymers and blends thereof. These materials may be cryogenically ground or otherwise milled or processed to form reticulate or other particulates.

[0041] As may be seen with reference again to Fig. 3, the domains 74 of the resin filler component may comprise a portion of the polishing surface 52, such as by having a thickness, referenced at “t” for the domain referenced at 74, or other dimension such that the domains extend through the thickness of the layer 60, or such as by being provided, as shown by the domains commonly referenced at 74', as dispersed throughout the thickness dimension of the layer 60 so as to be exposed as the surface 52 wears or is dressed. As forming a portion of the polishing surface 52, the domains of the resin filler component may modify the properties, such as coefficient of friction or hardness, thereof so as to assist in the polishing of the work piece surface. In addition, the domains 74, by acting as a filler, may improve the conductivity of the electrically-compound by increasing the de-
A polishing article for the electrochemical mechani-
ably, the compound and/or the filler in the compound.

"overpotential" may be used in reference to, interchange-
pound. As used herein, the terms "overvoltage" and
sn-
From these data, it may be concluded that a graphite or
less positive potentials than the Gr and Sn electrodes.
overpotentials, i.e., the Cu electrode evolving oxygen at
positive of the Cu curve, and indicates higher oxygen
be seen, the curves for Gr and Sn are displaced to the
minimizing pad wear by function as abrasion-resistant stops within the layer 60.

[0042] In the production of commercial quantities of article 50, the polymeric and electrically-conductive filler components of the electrically-conductive compound of layer 60, along with any additional fillers or additives such as the resin filler component, may be compounded under general conditions of high shear and, optionally, temperature, in a roll mill or other mixer. Thereafter, a layer 60 of the compound may be coated on the carrier 62, or on a release sheet or other substrate in the absence of a carrier, in a conventional manner such as by, for example, spraying, knife coating, roller coating, casting, drum coating, dipping, dispensing, extrusion, screen printing, or other direct process, or by a transfer or other indirect process. After coating, the resultant layer 60 may be hardened, solidified, or otherwise cured, such as by a chemical cross-linking or other reaction, or by a physical process such as drying or cooling, to develop an adherent film, coating, or other residue or deposition of the layer 60 on the substrate.

[0043] Referring lastly to Fig. 4, the overvoltage curves of several representative materials for the electrically-conductive filler component are graphically depicted as plots of current versus voltage. The curves of Fig. 4 may be empirically obtained, such within an electrochemical cell as measured against a standard calomel electrode (SCE) as the anode. In Fig. 4, curves are shown for copper (Cu), graphite (Gr), and tin (Sn) over the first quadrant, with oxidation increasing along the x-axis. As may be seen, the curves for Gr and Sn are displaced to the positive of the Cu curve, and indicates higher oxygen overpotentials, i.e., the Cu electrode evolving oxygen at less positive potentials than the Gr and Sn electrodes. From these data, it may be concluded that a graphite or tin-filled compound would be more stable when used in the polishing articles herein than a copper-filled compound. As used herein, the terms "overvoltage" and "overpotential" may be used in reference to, interchangeably, the compound and/or the filler in the compound.

Claims

1. A polishing article for the electrochemical mechanical polishing (ECMP) of a workpiece, said article comprising an electrically-conductive compound which is formed into a layer, said compound comprising an admixture which comprises:

(a) a polymeric component forming a continuous phase in said layer; and
(b) an electrically-conductive filler component forming a first discrete phase within said continuous phase,

whereby, with the workpiece and the layer being electrically connected and with an electrical bias being applied between the workpiece and layer, the bias being capable of activating an electrochemical reaction, the compound exhibiting an overpotential of at least about 1 V for the activation of said reaction greater than said bias.

2. The polishing article of claim 1 wherein said electrically-conductive filler component is selected from the group consisting of graphite particles, metal particles, metal-coated metal particles, metal-coated non-metal particles, and mixtures thereof.

3. The polishing article of claim 1 wherein said electrically-conductive filler component comprises graphite particles.

4. The polishing article of claim 1 wherein said electrically-conductive filler component comprises tin particles.

5. The polishing article of claim 1 wherein said polymeric component comprises a urethane polymer or copolymer.

6. The polishing article of claim 1 wherein the compound comprises, by total weight of the components (a) and (b), between about 25-95% of the electrically-conductive filler component.

7. The polishing article of claim 1 wherein the electrically-conductive filler component comprises particles having a mean average particle size of between about 0.01-10 mil (0.25-250 μm).

8. The polishing article of claim 1 wherein the compound has an electrical volume resistivity of not greater than about 1 Ω·cm.

9. The polishing article of claim 1 wherein the admixture further comprises:

(c) a resin filler component forming a second discrete phase within said continuous phase, said second discrete phase being substantially free of said electrically-conductive filler component.

10. The polishing article of claim 9 wherein the compound comprises, by total weight of the components (a), (b), and (c), between about 1-10% of the resin filler component.

11. The polishing article of claim 9 wherein the resin filler component comprises particles having a mean average particle size of between about 0.08-2 mil (2-50 μm).
12. The polishing article of claim 9 wherein said resin filler component comprises particles of one or more thermoplastic resins.

13. The polishing article of claim 1 wherein said article further comprises a carrier, said layer of said electrically-conductive compound being supported on said carrier.

14. The polishing article of claim 13 wherein said carrier comprises a sheet of an electrically-conductive mesh.

15. An electrochemical mechanical polishing (ECMP) system for processing a workpiece, said system comprising:

   a polishing article electrically connected to the workpiece, said article comprising an electrically-conductive compound which is formed into a layer, said compound comprising an admixture which comprises:

   (a) a polymeric component forming a continuous phase in said layer; and
   (b) an electrically-conductive filler component forming a first discrete phase within said continuous phase,

   a workpiece electrically connected to the layer; and

   an electrical bias applied between the workpiece and the layer,

   whereby, with the electrical bias applied between the workpiece and the layer being capable of activating an electrochemical reaction, the compound exhibiting an overpotential of at least about 1 V for the activation of said reaction greater than said bias.

16. The ECMP system of claim 15 wherein the layer has a processing surface and the workpiece has a workpiece surface disposed against the processing surface of the layer.

17. The ECMP system of claim 15 wherein said electrically-conductive filler component is selected from the group consisting of graphite particles, metal particles, metal-coated metal particles, metal-coated non-metal particles, and mixtures thereof.

18. The ECMP system of claim 15 wherein said electrically-conductive filler component comprises graphite particles.

19. The ECMP system of claim 15 wherein said electrically-conductive filler component comprises tin particles.

20. The ECMP system of claim 15 wherein said polymeric component comprises a urethane polymer or copolymer.

21. The ECMP system of claim 15 wherein the compound comprises, by total weight of the components (a) and (b), between about 25-95% of the electrically-conductive filler component.

22. The ECMP system of claim 15 wherein the electrically-conductive filler component comprises particles having a mean average particle size of between about 0.01-10 mil (0.25-250 μm).

23. The ECMP system of claim 15 wherein the compound has an electrical volume resistivity of not greater than about 1 Ω-cm.

24. The ECMP system of claim 15 wherein the admixture further comprises:

   (c) a resin filler component forming a second discrete phase within said continuous phase, said second discrete phase being substantially free of said electrically-conductive filler component.

25. The ECMP system of claim 24 wherein the compound comprises, by total weight of the components (a), (b), and (c), between about 1-10% of the resin filler component.

26. The ECMP system of claim 24 wherein the resin filler component comprises particles having a mean average particle size of between about 0.08-2 mil (2-50 μm).

27. The ECMP system of claim 24 wherein said resin filler component comprises particles of one or more thermoplastic resins.

28. The ECMP system of claim 15 wherein said article further comprises a carrier, said layer of said electrically-conductive compound being supported on said carrier.

29. The ECMP system of claim 28 wherein said carrier comprises a sheet of an electrically-conductive mesh.

30. An electrochemical mechanical polishing (ECMP) method for processing a surface of a workpiece, said method comprising the steps of:

   (a) providing a polishing article, the article comprising an electrically-conductive compound which is formed into a layer having a processing surface, said compound comprising an admix-
The method which comprises:

(I) a polymeric component forming a continuous phase in said layer; and
(II) an electrically-conductive filler component forming a first discrete phase within said continuous phase,

(b) electrically connecting the layer of step (a) to the workpiece; and
(c) applying an electrical bias between the workpiece and the layer, the bias being capable of activating an electrochemical reaction, and the compound of the layer exhibiting an overpotential of at least about 1 V for the activation of said reaction greater than said bias,

wherein the layer of step (a) has a processing surface, and wherein the method further comprising the additional step following step (a) of:

disposing the surface of the workpiece against the processing surface of the layer.

31. The ECMP method of claim 30 wherein said electrically-conductive filler component is selected from the group consisting of graphite particles, metal particles, metal-coated metal particles, metal-coated non-metal particles, and mixtures thereof.

32. The ECMP method of claim 30 wherein said electrically-conductive filler component comprises graphite particles.

33. The ECMP method of claim 30 wherein said electrically-conductive filler component comprises tin particles.

34. The ECMP method of claim 30 wherein said polymeric component comprises a urethane polymer or copolymer.

35. The ECMP method of claim 30 wherein the compound comprises, by total weight of the components (I) and (II), between about 25-95% of the electrically-conductive filler component.

36. The ECMP method of claim 30 wherein the electrically-conductive filler component comprises particles having a mean average particle size of between about 0.01-10 mil (0.25-250 µm).

37. The ECMP method of claim 30 wherein the compound has an electrical volume resistivity of not greater than about 1 Ω-cm.

38. The ECMP method of claim 30 wherein the admixture further comprises:

(III) a resin filler component forming a second discrete phase within said continuous phase, said second discrete phase being substantially free of said electrically-conductive filler component.

39. The ECMP method of claim 38 wherein the compound comprises, by total weight of the components (I), (II), and (III), between about 1-10% of the resin filler component.

40. The ECMP method of claim 38 wherein the resin filler component comprises particles having a mean average particle size of between about 0.08-2 mil (2-50 µm).

41. The ECMP method of claim 38 wherein said resin filler component comprises particles of one or more thermoplastic resins.

42. The ECMP method of claim 30 wherein said article further comprises a carrier, said layer of said electrically-conductive compound being supported on said carrier.

43. The ECMP method of claim 42 wherein said carrier comprises a sheet of an electrically-conductive mesh.

Patentansprüche

1. Poliergegenstand für das elektrochemisch-mechanische Polieren (ECMP) eines Werkstücks, wobei der Gegenstand eine elektrisch leitfähige Verbindung, die in einer Schicht ausgebildet ist, umfaßt, wobei die Verbindung ein Gemisch umfaßt, welches folgendes beinhaltet:

(a) eine polymere Komponente, die in der Schicht eine kontinuierliche Phase bildet, und
(b) eine elektrisch leitfähige Füllkomponente, die eine erste diskrete Phase innerhalb der kontinuierlichen Phase bildet,

wobei, wenn das Werkstück und die Schicht elektrisch miteinander verbunden sind und eine elektrische Vorspannung zwischen dem Werkstück und der Schicht angelegt wird, die Vorspannung eine elektrochemische Reaktion aktivieren kann, wobei die Verbindung ein Überpotential von wenigstens etwa 1 V für die Aktivierung der Reaktion größer als die Vorspannung aufweist.

2. Poliergegenstand nach Anspruch 1, wobei die elektrisch leitfähige Füllkomponente aus der Gruppe ausgewählt ist, bestehend aus Graphitteilchen, Metallteilchen, metallbeschichteten Metallteilchen, me-
tallbeschichteten Nicht-Metallteilchen und Gemi-

3. Poliergegenstand nach Anspruch 1, wobei die elek-

4. Poliergegenstand nach Anspruch 1, wobei die elek-

5. Poliergegenstand nach Anspruch 1, wobei die poly-

6. Poliergegenstand nach Anspruch 1, wobei die Ver-

7. Poliergegenstand nach Anspruch 1, wobei die elek-

8. Poliergegenstand nach Anspruch 1, wobei die Ver-

9. Poliergegenstand nach Anspruch 1, wobei das Ge-

10. Poliergegenstand nach Anspruch 9, wobei die Ver-

11. Poliergegenstand nach Anspruch 9, wobei die Harz-

12. Poliergegenstand nach Anspruch 9, wobei die Harz-

13. Poliergegenstand nach Anspruch 1, wobei der Ge-

14. Poliergegenstand nach Anspruch 13, wobei der Trä-

15. Elektrochemisch-mechanisches Polier-

16. ECMP-System nach Anspruch 15, wobei die Schicht

17. ECMP-System nach Anspruch 15, wobei die elek-

18. ECMP-System nach Anspruch 15, wobei die elek-

19. ECMP-System nach Anspruch 15, wobei die elek-

20. ECMP-System nach Anspruch 15, wobei die poly-

ger eine Bahn aus einem elektrisch leitfähigen Netz

1. Poliergegenstand, wobei die elektrisch leitfähige Füllkomponente Graphitteilchen um-

2. Poliergegenstand, wobei die elektrisch leitfähige Füllkomponente Zinnteilchen um-

3. Poliergegenstand, wobei die elektrisch leitfähige Füllkomponente Urethanpolymer oder -co-

4. Poliergegenstand, wobei die elektrisch leitfähige Füllkomponente Teilchen mit einer mittleren Teilchengröße von zwischen etwa 0,01-10 Mil (0,25-250 μm) umfaßt.

5. Poliergegenstand, wobei die elektrisch leitfähige Füllkomponente Teilchen von einem oder mehreren thermoplastischen Harzen umfaßt.

6. Poliergegenstand, wobei der Gegenstand weiterhin einen Träger umfaßt und die Schicht aus der elektrisch leitfähigen Verbindung auf diesem Träger getragen wird.

7. Poliergegenstand, wobei die Verbindung zwischen etwa 25-95%, bezogen auf das Gesamtgewicht der Komponenten (a) und (b), der elektrisch leitfähigen Füllkomponente umfaßt.

8. Poliergegenstand, wobei die Verbindung einen elektrischen Volumenwiderstand von nicht mehr als etwa 1 Ω·cm hat.

9. Poliergegenstand, wobei das Gemisch weiterhin folgendes umfaßt:

10. Poliergegenstand, wobei die Verbindung zwischen etwa 1-10%, bezogen auf das Gesamtgewicht der Komponenten (a), (b) und (c), der Harz-Füllkomponente umfaßt.

11. Poliergegenstand, wobei die Harz-Füllkomponente Teilchen mit einer mittleren Teilchengröße von zwischen etwa 0,08-2 Mil (2-50 μm) umfaßt.

12. Poliergegenstand, wobei die Harz-Füllkomponente Teilchen von einem oder mehreren thermoplastischen Harzen umfaßt.

13. Poliergegenstand, wobei der Gegenstand weiterhin einen Träger umfaßt und die Schicht aus der elektrisch leitfähigen Verbindung auf diesem Träger getragen wird.

14. Poliergegenstand, wobei der Träger eine Bahn aus einem elektrisch leitfähigen Netz umfaßt.

15. Elektrochemisch-mechanisches Polier- (ECMP-) System zum Bearbeiten eines Werkstücks, wobei das System folgendes umfaßt:

16. ECMP-System nach Anspruch 15, wobei die Schicht eine Bearbeitungs Oberfläche hat und das Werkstück eine Werkstückoberfläche hat, die in Richtung gegen die Bearbeitungs Oberfläche der Schicht angeordnet ist.

17. ECMP-System nach Anspruch 15, wobei die elektrisch leitfähige Füllkomponente aus der Gruppe ausgewählt ist, bestehend aus Graphitteilchen, Metalteilchen, metallobeschichteten Metalteilchen, metallobeschichteten Nicht-Metallteilchen und Gemischen davon.

18. ECMP-System nach Anspruch 15, wobei die elektrisch leitfähige Füllkomponente Graphitteilchen umfaßt.

19. ECMP-System nach Anspruch 15, wobei die elektrisch leitfähige Füllkomponente Zinnteilchen umfaßt.

20. ECMP-System nach Anspruch 15, wobei die polymere Komponente ein Urethanpolymer oder -copolymer umfaßt.
21. ECMP-System nach Anspruch 15, wobei die Verbindung zwischen etwa 25-95\%, bezogen auf das Gesamtgewicht der Komponenten (a) und (b), der elektrisch leitfähigen Füllkomponente umfaßt.

22. ECMP-System nach Anspruch 15, wobei die elektrisch leitfähige Füllkomponente Teilchen mit einer mittleren Teilchengröße von zwischen etwa 0,01-10 Mil (0,25-250 µm) umfaßt.

23. ECMP-System nach Anspruch 15, wobei die Verbindung einen elektrischen Volumenwiderstand von nicht mehr als etwa 1 Ω-cm hat.

24. ECMP-System nach Anspruch 15, wobei das Gemisch weiterhin folgendes umfaßt:
   (c) eine Harz-Füllkomponente, die eine zweite diskrete Phase innerhalb der kontinuierlichen Phase bildet, wobei die zweite diskrete Phase im wesentlichen frei von der elektrisch leitfähigen Füllkomponente ist.

25. ECMP-System nach Anspruch 24, wobei die Verbindung zwischen etwa 1-10\%, bezogen auf das Gesamtgewicht der Komponenten (a), (b) und (c), der Harz-Füllkomponente umfaßt.

26. ECMP-System nach Anspruch 24, wobei die Harz-Füllkomponente Teilchen mit einer mittleren Teilchengröße von zwischen etwa 0,08-2 Mil (2-50 µm) umfaßt.

27. ECMP-System nach Anspruch 24, wobei die Harz-Füllkomponente Teilchen von einem oder mehreren thermoplastischen Harzen umfaßt.

28. ECMP-System nach Anspruch 15, wobei der Gegenstand weiterhin einen Träger umfaßt und die Schicht aus der elektrisch leitfähigen Verbindung auf dem Träger getragen wird.

29. ECMP-System nach Anspruch 28, wobei der Träger eine Bahn aus einem elektrisch leitfähigen Netz umfaßt.

30. Elektrochemisch-mechanisches Polier- (ECMP-) Verfahren zum Bearbeiten der Oberfläche eines Werkstücks, wobei das Verfahren die folgenden Stufen umfaßt:
   (a) Bereitstellen eines Poliergegenstands, wobei der Gegenstand eine elektrisch leitfähige Verbindung, die in einer Schicht mit einer Bearbeitungsverhältnisfläche ausgebildet ist, umfaßt, wobei die Verbindung ein Gemisch umfaßt, welches folgendes beinhaltet:

31. ECMP-Verfahren nach Anspruch 30, wobei die elektrisch leitfähige Füllkomponente aus der Gruppe ausgewählt ist, bestehend aus Graphitteilen, Metalleteilen, metallbeschichteten Metallteilen, metallbeschichteten Nicht-Metalleteilen und Gemischen davon.

32. ECMP-Verfahren nach Anspruch 30, wobei die elektrisch leitfähige Füllkomponente Graphitteilchen umfaßt.

33. ECMP-Verfahren nach Anspruch 30, wobei die elektrisch leitfähige Füllkomponente Zinnteilchen umfaßt.

34. ECMP-Verfahren nach Anspruch 30, wobei die polymere Komponente ein Urethanpolymer oder -copolymer umfaßt.

35. ECMP-Verfahren nach Anspruch 30, wobei die Verbindung zwischen etwa 25-95\%, bezogen auf das Gesamtgewicht der Komponenten (I) und (II), der elektrisch leitfähigen Füllkomponente umfaßt.

36. ECMP-Verfahren nach Anspruch 30, wobei die elektrisch leitfähige Füllkomponente Teilchen mit einer mittleren Teilchengröße von zwischen etwa 0,01-10 Mil (0,25-250 µm) umfaßt.

37. ECMP-Verfahren nach Anspruch 30, wobei die Verbindung einen elektrischen Volumenwiderstand von nicht mehr als etwa 1 Ω-cm hat.
38. ECMP-Verfahren nach Anspruch 30, wobei das Gemisch weiterhin folgendes umfaßt:

(III) eine Harz-Füllkomponente, die eine zweite diskrete Phase innerhalb der kontinuierlichen Phase bildet, wobei die zweite diskrete Phase im wesentlichen frei von der elektrisch leitfähigen Füllkomponente ist.

39. ECMP-Verfahren nach Anspruch 38, wobei die Verbindung zwischen etwa 1-10%, bezogen auf das Gesamtgewicht der Komponenten (I), (II) und (III), der Harz-Füllkomponente umfaßt.

40. ECMP-Verfahren nach Anspruch 38, wobei die Harz-Füllkomponente Teilchen mit einer mittleren Teilchengröße von zwischen etwa 0,08-2 Mili (2-50 μm) umfaßt.

41. ECMP-Verfahren nach Anspruch 38, wobei die Harz-Füllkomponente Teilchen von einem oder mehreren thermoplastischen Harzen umfaßt.

42. ECMP-Verfahren nach Anspruch 30, wobei der Gegenstand weiterhin einen Träger umfaßt, wobei die Schicht der elektrisch leitfähigen Verbindung auf dem Träger getragen wird.

43. ECMP-Verfahren nach Anspruch 42, wobei der Träger eine Bahn aus einem elektrisch leitfähigen Netz umfaßt.

Revendications

1. Article de polissage destiné au polissage électrochimique mécanique (ECMP) d’une pièce d’ouvrage, ledit article comprenant un composant électriquement conducteur qui est formé dans une couche, ledit composant comprenant un adjuvant qui comprend :

(a) un composant polymère formant une phase continue dans ladite couche, et
(b) un composant de charge électriquement conducteur formant une première phase discrète à l’intérieur de ladite phase continue,

grâce à quoi, la pièce d’ouvrage et la couche étant électriquement reliées et une polarisation électrique étant appliquée entre la pièce d’ouvrage et la couche, la polarisation est capable d’activer une réaction électrochimique, le composant présentant une surtension d’au moins environ 1 V pour l’activation de ladite réaction supérieure à ladite polarisation.

2. Article de polissage selon la revendication 1, dans lequel le composant de charge électriquement conducteur est sélectionné parmi le groupe constitué de particules de graphite, de particules métalliques, de particules métalliques revêtues d’un métal, de particules non métalliques revêtues de métal et de leurs mélanges.

3. Article de polissage selon la revendication 1, dans lequel le composant de charge électriquement conducteur comprend des particules de graphite.

4. Article de polissage selon la revendication 1, dans lequel le composant de charge électriquement conducteur comprend des particules d’étain.

5. Article de polissage selon la revendication 1, dans lequel le composant polymère comprend un polymère ou un copolymère d’uréthane.

6. Article de polissage selon la revendication 1, dans lequel le composant comprend, en poids total des composants (a) et (b), d’environ 25 à 95 % du composant de charge électriquement conducteur.

7. Article de polissage selon la revendication 1, dans lequel le composant comprend des particules ayant une taille de particule moyenne comprise entre environ 0,01 et 10 millièmes de pouce (0,01 à 250 μm).

8. Article de polissage selon la revendication 1, dans lequel le composant présente une résistivité volumique électrique qui n’est pas supérieure à environ 1 Ω·cm.

9. Article de polissage selon la revendication 1, dans lequel l’adjuvant comprend en outre :

(c) un composant de charge de résine formant une seconde phase discrète à l’intérieur de ladite phase continue, ladite seconde phase discrète étant pratiquement exempte dudit composant de charge électriquement conducteur.

10. Article de polissage selon la revendication 9, dans lequel le composant comprend, en poids total des composants (a), (b), (c), d’environ 1 à 10 % du composant de charge de résine.

11. Article de polissage selon la revendication 9, dans lequel le composant de charge de résine comprend des particules ayant une taille de particule moyenne comprise entre environ 0,08 et 2 millièmes de pouce (de 2 à 50 μm).

12. Article de polissage selon la revendication 9, dans lequel le composant de charge de résine comprend des particules d’une ou plusieurs résines thermoplastiques.
13. Article de polissage selon la revendication 1, dans lequel ledit article comprend en outre un support, ladite couche dudit composant électriquement conducteur étant supportée sur ledit support.

14. Article de polissage selon la revendication 13, dans lequel ledit support comprend une feuille constituée d’une maille électriquement conductrice.

15. Système de polissage électrochimique mécanique (ECMP) destiné à traiter une pièce d’ouvrage, ledit système comprenant :

- un article de polissage électriquement relié à la pièce d’ouvrage, l’article comprenant un composant électriquement conducteur qui est formé dans une couche, ledit composant comprenant un adjuvant qui comprend :
  
  (a) un composant polymère formant une phase continue dans ladite couche, et
  
  (b) un composant de charge électriquement conducteur formant une première phase discrète à l’intérieur de ladite phase continue,

- une pièce d’ouvrage électriquement reliée à la couche, et

- une polarisation électrique appliquée entre la pièce d’ouvrage et la couche, en conséquence de quoi, la polarisation électriquement appliquée entre la pièce d’ouvrage et la couche étant capable d’activer une réaction électrochimique, le composant présente une surtension d’au moins environ 1 V pour l’activation de ladite réaction supérieure à ladite polarisation.

16. Système de polissage ECMP selon la revendication 15, dans lequel la couche présente une surface de traitement et la pièce d’ouvrage présente une surface de pièce d’ouvrage disposée contre la surface de traitement de la couche.

17. Système de polissage ECMP selon la revendication 15, dans lequel ledit composant de charge électriquement conducteur est sélectionné parmi le groupe constitué de particules de graphite, de particules métalliques, de particules métalliques revêtues de métal, de particules non métalliques revêtues de métal et de leurs mélanges.

18. Système de polissage ECMP selon la revendication 15, dans lequel ledit composant de charge électriquement conducteur comprend des particules de graphite.

19. Système de polissage ECMP selon la revendication 15, dans lequel ledit composant de charge électriquement conducteur comprend des particules d’étain.

20. Système de polissage ECMP selon la revendication 15, dans lequel ledit composant polymère comprend un polymère ou un copolymère d’uréthane.

21. Système de polissage ECMP selon la revendication 15, dans lequel le composant comprend, en poids total des composants (a) et (b), d’environ 25 à 95 % du composant de charge électriquement conducteur.

22. Système de polissage ECMP selon la revendication 15, dans lequel le composant de charge électriquement conducteur comprend des particules ayant une taille de particule moyenne comprise entre environ 0,01 et 10 millièmes de pouce (de 0,25 à 250 μm).

23. Système de polissage ECMP selon la revendication 15, dans lequel le composant présente une résistivité volumique électrique qui n’est pas supérieure à environ 1 Ω·cm.

24. Système de polissage ECMP selon la revendication 15, dans lequel l’adjuvant comprend en outre :

  (c) un composant de charge de résine formant une seconde phase discrète à l’intérieur de ladite phase continue, ladite seconde phase discrète étant pratiquement exempte du composant de charge électriquement conducteur.

25. Système de polissage ECMP selon la revendication 24, dans lequel le composant comprend, en poids total des composants (a), (b) et (c), d’environ 1 à 10 % du composant de charge de résine.

26. Système de polissage ECMP selon la revendication 24, dans lequel le composant de charge de résine comprend des particules ayant une taille de particule moyenne d’environ 0,08 à 2 millièmes de pouce (de 2 à 50 μm).

27. Système de polissage ECMP selon la revendication 24, dans lequel ledit composant de charge de résine comprend des particules d’une ou plusieurs résines thermoplastiques.

28. Système de polissage ECMP selon la revendication 15, dans lequel ledit article comprend en outre un support, ladite couche dudit composant électriquement conducteur étant supportée sur ledit support.

29. Système de polissage ECMP selon la revendication 28, dans lequel ledit support comprend une feuille constituée d’une maille électriquement conductrice.
Procédé de polissage électrochimique mécanique (ECMP) destiné à traiter une surface d’une pièce d’ouvrage, ledit procédé comprenant les étapes consistant à :

(a) procurer un article de polissage, l’article comprenant un composant électriquement conducteur qui est formé dans une couche ayant une surface de traitement, ledit composant comprenant un adjuvant qui comprend :

(I) un composant polymère formant une phase continue dans ladite couche, et
(II) un composant de charge électriquement conducteur formant une première phase discrète à l’intérieur de ladite phase continue,

(b) relier électriquement la couche de l’étape (a) à la pièce d’ouvrage, et
(c) appliquer une polarisation électrique entre la pièce d’ouvrage et la couche, la polarisation étant capable d’activer une réaction électrochimique, et le composant de la couche présentant une surtension d’au moins environ 1 V pour l’activation de ladite réaction supérieure à ladite polarisation,

dans lequel la couche de l’étape (a) présente une surface de traitement, et où le procédé comprend en outre l’étape supplémentaire après l’étape (a) consistant à :

disposer la surface de la pièce d’ouvrage contre la surface de traitement de la couche.

Procédé de polissage ECMP selon la revendication 30, dans lequel ledit composant comprend, en poids total des composants (I) et (II), d’environ 25 à 95 % du composant de charge électriquement conducteur.

Procédé de polissage ECMP selon la revendication 30, dans lequel le composant de charge électriquement conducteur comprend des particules ayant une taille de particule moyenne comprise entre environ 0,01 et 10 millièmes de pouce (de 0,25 à 250 μm).

Procédé de polissage ECMP selon la revendication 30, dans lequel le composant présente une résistivité volumique électrique qui n’est pas supérieure à environ 1 Ω-cm.

Procédé de polissage ECMP selon la revendication 30, dans lequel l’adjuvant comprend en outre :

(III) un composant de charge de résine formant une seconde phase discrète à l’intérieur de ladite phase continue, ladite seconde phase discrète étant pratiquement exempte dudit composant de charge électriquement conducteur.

Procédé de polissage ECMP selon la revendication 30, dans lequel le composant comprend, en poids total des composants (I), (II) et (III), d’environ 1 à 10 % du composant de charge de résine.

Procédé de polissage ECMP selon la revendication 38, dans lequel le composant de charge de résine comprend des particules ayant une taille de particule moyenne comprise entre environ 0,08 et 2 millièmes de pouce (de 2 à 50 μm).

Procédé de polissage ECMP selon la revendication 38, dans lequel le composant de charge de résine comprend des particules constituées d’une ou plusieurs résines thermoplastiques.

Procédé de polissage ECMP selon la revendication 30, dans lequel ledit article comprend en outre un support, ladite couche dudit composant électriquement conducteur étant supportée sur ledit support.

Procédé de polissage ECMP selon la revendication 42, dans lequel ledit support comprend une feuille constituée d’une maille électriquement conductrice.
REFERENCES CITED IN THE DESCRIPTION

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