The present disclosure generally relates to a slider having a textured bonding surface. The slider may be used in a hard disk drive (HDD). The textured bonding surface permits the slider to be effectively bonded to a suspension and prevent the slider from debonding from the suspension due to shear forces that may occur during HDD operation.
Fig. 2B

Fig. 2C
Fig. 5

TEXTURE BONDING SURFACE OF SLIDER BODY

TEXTURE ABS

BOND BONDING SURFACE OF SLIDER TO SUSPENSION
SLIDER BACK SIDE ETCHING TO INCREASE SHEAR STRENGTH BETWEEN SUSPENSION AND SLIDER

[0001] CROSS REFERENCE TO RELATED APPLICATION(S)

[0002] This application is a divisional of application Ser. No. 14/664,425 filed on Mar. 20, 2015, (Att’y Docket No. F7767), “Slider Back Side Etching To Increase Shear Strength Between Suspension And Slider” which is hereby incorporated by reference.

BACKGROUND


[0004] Embodiments of the present disclosure generally relate to a slider for use in a hard disk drive (HDD).

[0005] 2. Description of the Related Art

[0006] In HDDs, a magnetic head is disposed over a magnetic media. The magnetic head reads from, and writes data to, the magnetic media. The magnetic head has a surface, referred to as an air bearing surface (ABS), facing the magnetic media. As the magnetic head moves, air exerts a pressure on the ABS and pushes the magnetic head away from the magnetic media. The magnetic head is formed on a slider, which is coupled to a suspension. The suspension exerts a counter force that, when considered in concert with the moving media, ensures the magnetic head is disposed a predetermined distance from the magnetic media during operation.

[0007] The slider and the suspension are fabricated separately and then assembled by bonding the slider to the suspension. During operation, when the media moves, the slider is exposed to shear forces that may cause the slider to detach from the suspension.

[0008] Therefore, there is a need in the art for a slider that is capable of remaining attached to the suspension during operation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] So that the manner in which the above recited features of the present disclosure can be understood in detail, a more particular description of the disclosure, briefly summarized above, may be had by reference to embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this disclosure and are therefore not to be considered limiting of its scope, for the disclosure may admit to other equally effective embodiments.

[0010] FIG. 1 is a schematic illustration of a HDD according to one embodiment.

[0011] FIG. 2A is a schematic illustration of a slider coupled to a suspension disposed over a magnetic media according to one embodiment.

[0012] FIG. 2B is a schematic illustration of a slider bonding surface prior to texturing.

[0013] FIG. 2C is a schematic illustration of a slider bonding surface after texturing according to one embodiment.

[0014] FIG. 3A is an isometric illustration of a slider.

[0015] FIG. 3B is an isometric illustration of the slider of FIG. 3A when viewed from the bonding surface.

[0016] FIG. 3C is a cross sectional illustration of a slider coupled to a suspension according to one embodiment.

[0017] FIG. 3D is a schematic illustration of a bonding surface of a slider according to one embodiment.

[0018] FIG. 4 is an isometric illustration of a HAMR slider with submount according to one embodiment.

[0019] FIG. 5 is a flow chart illustrating the method of producing the textured slider bonding surface.

[0020] To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures. It is contemplated that elements disclosed in one embodiment may be beneficially utilized on other embodiments without specific recitation. It is to be understood that all drawings are not to scale.

DETAILED DESCRIPTION

[0021] The present disclosure generally relates to a slider having a textured bonding surface. The slider may be used in a hard disk drive (HDD). The textured bonding surface permits the slider to be effectively bonded to a suspension and prevent the slider from debonding from the suspension due to shear forces that may occur during HDD operation.

[0022] FIG. 1 is a schematic illustration of a magnetic recording device, such as a hard disk drive (HDD) 100, according to one embodiment. The HDD 100 includes at least one magnetic recording medium, such as a disk 102 that is supported on a spindle 104. A motor causes the spindle 104, and hence the disk 102, to rotate. A magnetic head that is mounted on a slider 108 moves over the disk 102 to read and write information from/to the disk 102. The head rides on an air bearing above the disk 102 during read/write operations. The slider 108 is coupled to an actuator 110 by a suspension 112 and arm 114. The suspension 112, which may comprise stainless steel, provides a slight spring force, which biases the slider 108 towards the disk surface. Each actuator 110 is attached to an actuator means that controls the movement of the head 106 relative to the disk 102.

[0023] FIG. 2A is a schematic illustration of a slider 108 having a head 106 coupled to a suspension 112 disposed over a magnetic media 202 according to one embodiment. The slider 108 has an ABS 204 facing the magnetic media 202.

[0024] FIG. 2B is a schematic illustration of a suspension bonding surface 203. The suspension 112 has a length shown by arrows “A” and a width shown by arrows “B”. The surface area of the suspension bonding surface 203 is equal to AxB which may be up to about 0.6 mm². Prior to texturing, the slider bonding surface 206 may have the same surface area as the suspension bonding surface 203. After texturing, however, the slider bonding surface 206 surface area will be greater than the suspension bonding surface 203 surface area.

[0025] FIG. 2C is a schematic illustration of a slider bonding surface 206 after texturing according to one embodiment. After texturing, features 208 have been formed into the slider bonding surface 206. The features 208 are formed a depth into the slider bonding surface 206 and as such, the total surface area of the slider bonding surface is increased as compared to the slider bonding surface 206 prior to texturing. The surface area after texturing may be greater than about 0.6 mm². In one embodiment, the surface area may be between about 0.62 mm² and about 0.85 mm², such as between about 0.65 mm² and about 0.72 mm², and between about 0.67 mm² and about 0.69 mm². The features 208, which may be referred to as slots, may be formed to a depth of greater than about 0.001 mm, such as between about 0.002 mm and about 0.010 mm, such as between about 0.005 mm and about 0.005 mm, such as 0.004 mm.
[0026] FIG. 3A is an isometric illustration of a slider 108. The slider 108 has the ABS 204. Electrical contact points 302 are shown as well. The electrical contact points 302 are used to connect the slider 108 to the controller for the HDD, such as a voice coil motor. FIG. 3B is an isometric illustration of the slider 108 of FIG. 3A when viewed from the bonding surface 206. The features 208 are shown in FIG. 3B and can be seen as indented into the bonding surface 206. In the embodiment shown in FIG. 3B, the features 208 are disposed in a central region of the slider bonding surface 206 and do not extend all the way to the edge of the slider bonding surface 206. It is to be understood that the features 208 may be disposed over the entire slider bonding surface 206. Additionally, it is to be understood that the features 208 may be disposed into the slider bonding surface 206 at a location other than the central area of the slider bonding surface 206. The feature 208 location shown in FIG. 3B is not to be limited, but rather, simply an example of one possibility.

[0027] FIG. 3C is a cross-sectional illustration of a slider 108 coupled to a suspension 112 according to one embodiment. An adhesive material 304 is used between the slider 108 and the suspension 112. In one embodiment, the adhesive material 304 may comprise an epoxy that may be cured by UV radiation or an annealing in an oven. As shown in the cross-sectional illustration, the textured surface of the bonding surface increases the surface area (as compared to a non-textured surface) and thus increases the area upon which the adhesive material is present. Hence, the textured bonding surface 206, due to the increased surface area, is more difficult to separate from the suspension during operation and can therefore withstand a greater shear force.

[0028] FIG. 3D is a schematic illustration of a bonding surface 206 of a slider 108 according to one embodiment. The texture features 208 are separated from the edge of the slider 108 by an edge area 306 by a distance shown by arrows “C” which may be between about 0.065 mm and about 0.075 mm. As such, the textured area is in a middle area of the slider body. In one embodiment, the features 208 may be spaced apart by a distance shown by arrows “D” and be between about 0.010 mm and about 0.020 mm. The features themselves may have a width and length shown by arrows “E” of between about 0.020 mm and about 0.030 mm. The pitch between features may be shown by arrows “F” and be between about 0.030 mm and about 0.050 mm. It is to be understood that while the features 208 have been shown as squares, other shapes are contemplated as well such as circles, sphere, diamonds, or combinations thereof.

[0029] FIG. 4 is an isometric illustration of a HAMR slider 400 with submount 402 according to one embodiment. A textured slider bonding surface is not limited to perpendicular magnetic recording, but rather, is applicable to any magnetic recording technique. For example, the texturing may be used for a HAMR slider 400 as shown in FIG. 4. As shown in FIG. 4, rather than texturing the entire bonding surface, only a selected portion of the slider is textured while a remainder of the slider 400 is intended to extend beyond the suspension so that the submount 402 may have room for mounting.

[0030] FIG. 5 is a flowchart illustrating the method of producing a HDD. Initially, the bonding surface 206 of the slider 108 is textured (502) by way of conventional methods such as etching using a plasma or a wet etching process. Thereafter, the ABS is formed by a texturing process (504). Finally, the slider is bonded to the suspension (506).

[0031] The benefit of using a textured slider bonding surface include an increase in surface area of the slider bonding surface such that the shear stress required to debond the slider from a suspension is increased compared to a non-textured slider bonding surface. The goal of the texturing is to create a large a surface area as possible for bonding to ensure the shear stress needed to debond the slider from the suspension is greater than the shear stress that occurs during normal device operation. It is to be understood that the texturing described herein is applicable to all types of sliders utilized in magnetic recording.

[0032] While the foregoing is directed to embodiments of the present disclosure, other and further embodiments of the disclosure may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

1. A method of manufacturing a magnetic recording device, comprising:
   texturing a bonding surface of a slider body;
   texturing an air bearing surface of a slider body;
   bonding the bonding surface of the slider body to a first surface of a suspension, wherein the bonding surface has a surface area that is greater than a surface area of the first surface.
2. The method of claim 1, wherein the texturing the bonding surface comprises etching.
3. The method of claim 2, wherein the etching is a wet etching process.
4. The method of claim 1, wherein the bonding surface includes an edge area and a middle area, wherein the middle area includes a plurality of slots, and wherein the middle area is spaced between about 0.065 mm to about 0.075 mm from an edge of the slider body.
5. The method of claim 4, wherein the slots extend to a depth of greater than 0.001 mm into the slider body.