

Title of the Invention

Method for manufacturing a magnetic recording medium

5 Technical field of the invention

The present invention relates to a method for manufacturing a magnetic recording medium used in a memory device, in particular a hard disk drive, that is installed in an information memory device of an information processing apparatus of computer or an apparatus for private use.

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Background of the invention

With increase in amount of information treated by an information processing apparatus such as a computer and miniaturization of such an apparatus in recent years, recording capacity of an information memory device has enhanced and recording capacity of a magnetic recording medium used in the information memory device is continuously increasing. Enhancement of recording density requires decrease of bit length that is a unit of information recording and minimization of fly height of a recording head.

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For the minimization of fly height of the head, elimination of protrusions on the surface of the magnetic recording medium is indispensable. Accordingly, burnishing is carried out on the surface of the magnetic recording medium using a polishing tape coated with abrasive grains of alumina after formation of a protective film or before a glide height test after application of liquid lubricant.

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Problem to be solved by the invention

However, since a protective film is becoming consistently thinner in recent years, the tape-burnishing on the surface of the recording medium after protective film formation generates scratches, which may raise problems in error quality and anti-corrosion.

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These problems are significant when a soft plastic substrate is used. Film thickness of a lubricant layer of a recording medium after application of a liquid lubricant on the protective film and before the glide test is at most about 2 nm since the thickness is optimized for attaining good characteristics in friction and adhesion at head contact. Such value of the thickness produces little effect to suppress the scratch generation due to burnishing. Dust and particles are also generated on the surface of the recording medium due to the tape-burnishing. The dust and particles remain after the burnishing process and are drawn into air stream that is developed by the head with low fly height at seeking operation of the recording medium. As a result, electromagnetic conversion characteristic is significantly affected, and in the worst case, head crash occurs, and serious effect is caused on reliability of the magnetic recording device.

15 Means to solve the problems

For solving the above problems, the inventor of the present invention energetically conducted repeated experiments and study, and has found the following knowledge.

20 Application of a lubricating agent with an appropriate thickness, for example 5 to 10 nm, before tape burnishing is desirable in order to prevent generation of scratches. However, if the lubricating agent is remained as a liquid lubricant layer, the thickness is too large and the dust is left there, to affect the characteristics of the recording medium. Consequently, the lubricating agent selected is easily removable after burnishing, and after removal, a liquid lubricant layer is formed anew for operation of the recording medium. By these means, the problems of the conventional technology described earlier are solved.

30 The present invention is accomplished based on the knowledge, and a manufacturing method of a magnetic recording medium according to the invention comprises steps of sequentially laminating a non-magnetic metallic

under-layer, a magnetic layer, and a protective layer on a non-magnetic substrate, applying a lubricating agent on the protective layer, burnishing a surface of the laminated substrate that is coated with the lubricating agent, washing the lubricating agent away using a solvent, and laminating a liquid
5 lubricant layer on the protective layer.

Aspect of embodiments of the invention

In the construction described above, the lubricating agent has preferably a mean molecular weight of not smaller than 10,000 in order to withstand the
10 friction due to tape-burnishing, and preferably lacks a functional end group in order to easily wash away using a solvent together with the dust and others on the surface of the recording medium.

This washing step is preferably performed by means of spin-coating at
15 high rotational speed of not smaller than 1,000 rpm since the dust and particles generated by tape-burnishing can be removed using centrifugal force simultaneously.

Brief description of the drawings

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Fig. 1

A drawing showing a layer structure of a magnetic recording medium obtained by an embodiment of a method for manufacturing a magnetic recording medium of the present invention.

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Examples

Now, examples of some embodiments of the invention will be described referring to a drawing. The examples of embodiments in the following are only for explaining the invention and the invention should not be limited to
30 the examples.

As shown in Figure 1, an under-layer 2, a magnetic layer 3, and a protective layer 4 were formed in this order on a plastic substrate 1 by a sputtering method. After that, three types of recording media were produced, in which (a) Brayco 815Z manufactured by Castrol Co., Ltd. was applied to 10 nm thickness by spin-coating method, (b) AM2001 manufactured by Ausimont S. p. A. was applied to 2 nm thickness, and (c) any lubricating agent was not applied. Each of the three types of recording media was processed by burnishing using a polishing tape WA10000 manufactured by Japan Microcoating Co., Ltd., at a rotating speed of 1,500 rpm, with pad hardness of 25° and pushing pressure of 0.04 kgf/cm². On each of the recording medium after burnishing, number of scratches was counted using an optical visual inspection apparatus manufactured by Phasemetrics Co., Ltd. The result, that is a difference from an initial value, is shown in Table 1. The recording medium of (a) was then washed by spinning at 2,000 rpm using a detergent Fluorinate FC77 manufactured by Sumitomo 3M Co., Ltd., and coated to the thickness of 2 nm with a liquid lubricant AM2001 manufactured by Ausimont S.p.A. for a liquid lubricant layer. On this recording medium and the two recording media of (b) and (c), number of particles was measured using the optical visual inspection apparatus. The result, that is a difference from the initial value, is shown in Table 2.

Table 1

	Δ number of scratches
recording medium (a)	1
recording medium (b)	6
recording medium (c)	15

[Table 2]

	Δ number of particles
Recording medium (a)	2
Recording medium (b)	12
Recording medium (c)	35

These results demonstrate that excellent results have been obtained on the recording medium (a), to which the present invention has been applied; namely, scratches due to tape-burnishing was suppressed and effect of
5 particle elimination was also confirmed.

Advantageous Effect of the invention

According to the method for manufacturing a magnetic recording medium of the present invention, scratches and dust contamination on the
10 surface due to tape-burnishing are prevented by means of application of a lubricating agent before the burnishing and spinning washing using a solvent after burnishing.

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Claims

1 A method for manufacturing a magnetic recording medium comprising steps of:

- 5 sequentially laminating a non-magnetic metallic under-layer, a magnetic layer and a protective layer on a non-magnetic substrate, applying a lubricating agent on said protective layer, burnishing a surface of laminated substrate that is coated with said lubricating agent,
- 10 washing said lubricating agent away using a solvent, and laminating a liquid lubricant layer on said protective layer.

2 A method for manufacturing a magnetic recording medium according to claim 1, wherein said lubricating agent does not include a functional end
15 group.

3 A method for manufacturing a magnetic recording medium according to claim 1, wherein said step of washing comprises a process of spin-coating a solvent on a surface of laminated substrate with a rotating speed of not less
20 than 1,000 rpm after said step of burnishing, to remove said lubricating agent and to eliminate dusts and particles that are generated in said step of burnishing; and

said step of laminating a liquid lubricant layer comprises a process of applying a liquid lubricant having a functional end group.

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