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Improved Embedded Alumina Defect Performance through a Multi Particle Slurry for Hard Disk Polishing

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Presentation Outline

- Industry memory requirement trend
- Some problems due to embedded alumina defects
- Defect formation mechanism
- How to minimize embedded alumina defects on Ni-P surfaces ?
- Conclusions

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HDD Industry Technology Road map



Higher field densities are desired by HDD technology road map

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Embedded Alumina Defect Challenges





- 1. Low S/N ratios
- 2. Obstruct slider motion above substrate surface
- 3. Distortion in magnetic field in defect region

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Embedded Alumina Defect Formation Mechanism

- 1st step slurry in HDD substrate polishing is the only alumina source to cause embedded alumina defects
- Embedded alumina is seen either at post 2nd step defect review or at device failure
- Sharp edges of alumina gets embedded into Ni-P layer, leaving fractured particle(s) inside surface film
- Particles still resides in film after P2 polish
- Subsequent process steps magnifies the presence of the embedded particle
- Methods such as FIB, FESEM, and SEM EDX reveal the defect type to be Al_2O_3

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Irregular shape alumina in slurry



Multi Particle Slurry for Low Embedded Alumina

- 1. Large Alumina
- 2. Small Cabot Alumina
- 3. Colloidal Silica
- 4. Complexing agent
- 5. Oxidizer
- 6. Additive at Point of Use

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Alumina-Silica Interaction Mechanism



• Electrostatic attraction between alumina and silica particles leads silica to coat around alumina

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Solution for Embedded Alumina

US Patent 6.896,591 B2

Irregular shape alumina 0.1um – 0.9um



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Regular shape

0.05um – 0.4um

alumina

Candela Defect Maps after 2nd Step Polish



• Pure alumina 1st step slurry polish disks give higher particles on disk surface. Defects maps were taken after P2 polish process.

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Conclusions

 Due to opposite surface charges on alumina and silica, silica particles get coated around alumina in slurry media

 Silica particle coating around alumina makes the substrate - particle interaction less sever to prevent embedded alumina defects

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