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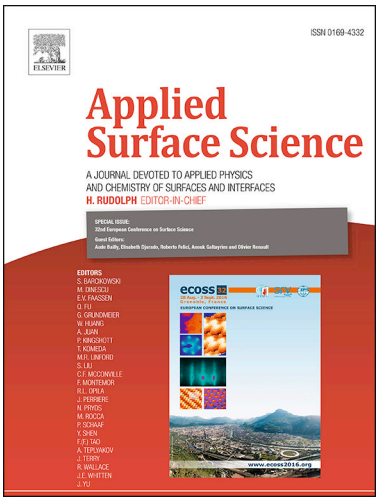

Full Length Article

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Molecular Dynamics Study of Lubricant Depletion by Pulsed Laser Heating

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Abstract

In this study, molecular dynamics simulations were performed to numerically investigate the effect of pulsed laser heating on lubricant depletion. The maximum temperature, the lubricant depletion width, the number of evaporated lubricant beads and the number of fragmented lubricant chains were studied as a function of laser peak power, pulse duration and repetition rate. A continuous-wave laser and a square pulse laser were simulated and compared to a Gaussian pulse laser. With increasing repetition rate, pulsed laser heating was found to approach continuous-wave laser heating.

***Keywords*:** heat assisted magnetic recording, pulsed laser, lubricant depletion, lubricant fragmentation, perfluoropolyether, head-disk interface

Introduction

In order to increase the areal density of hard disk drives, heat assisted magnetic recording is being investigated as an alternative to perpendicular magnetic recording. In heat assisted magnetic recording, a high coercivity magnetic material is used in conjunction with laser heating to lower the coercivity of the magnetic material to enable writing. Heat assisted magnetic recording requires a number of novel components that need to be optimized such as the laser delivery system, the thermomagnetic write head, the head-disk interface, and the magnetic media with stable thermal properties [1]. To accomplish heat assisted magnetic recording, a laser beam is first “delivered” to a waveguide on the head, which guides the laser to the near-field transducer to reduce the spot size and focus the laser on the desired spot. The laser heats the spot on the disk to a temperature near the Curie temperature, lowering its magnetic coercivity for