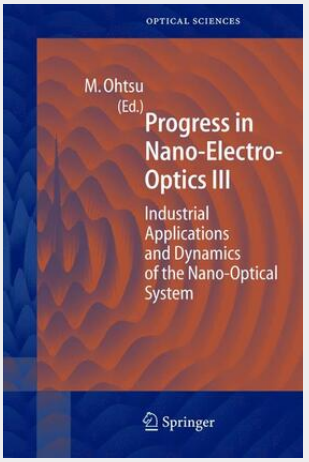
Ohtsu

Progress in Nano-Electro Optics III

Industrial Applications and Dynamics of the Nano-Optical System



Near-?eld optical recording is a promising way to realize a recording density 2 of over 1 Tb/in. In this chapter, we focused on the near-?eld optical head, which is a key device for near-?eld optical recording. First, we explained the technical issues regarding the near-? eld optical head and introduced some solutions to these issues. We focused on a highly e?cient near-?eld optical head that uses a wedge-shaped metallic plate, and described its optical pr- erties based on a simulation using a ?nite-di?erence time-domain method. The simulation results con?rmed that a strong optical near ?eld is generated at the apex of the metallic plate when a plasmon is excited in the metallic plate. When a TbFeCo recording medium was placed 10 nm from the ne- ?eld optical head, the size of the optical spot was 30 nm, which corresponds 2 to an areal recording density of approximately 1 Tb/in. The e?ciency was 20% if we assume that the incident beam was a Gaussian beam with a full width at half-maximum of 1μ m. Furthermore, we discussed an optical head using two metallic plates. We con?rmed through our simulation that a highly localized optical near ?eld was generated at the gap when the plasmon was excited in the metallic plates. The distribution was 5 nm by 5 nm when the two apices were separated by 5 nm.

Near-?eld optical recording is a promising way to realize a recording density 2 of over 1 Tb/in. In this chapter, we focused on the near-?eld optical head, which is a key device for near-?eld optical recording. First, we explained the technical issues regarding the near-? eld optical head and introduced some solutions to these issues. We focused on a highly e?cient near-?eld optical head that uses a wedge-shaped metallic plate, and described its optical pr- erties based on a simulation using a ?nite-di?erence time-domain method. The simulation results con?rmed that a strong optical near ?eld is generated at the apex of the metallic plate when a plasmon is excited in the metallic plate. When a TbFeCo recording medium was placed 10 nm from the ne- ?eld optical head, the size of the optical spot was 30 nm, which corresponds 2 to an areal recording density of approximately 1 Tb/in. The e?ciency was 20% if we assume that the incident beam was a Gaussian beam with a full width at half-maximum of 1μ m. Furthermore, we discussed an optical head using two metallic plates. We con?rmed through our simulation that a highly localized optical near ?eld was generated at the gap when the plasmon was excited in the metallic plates. The distribution was 5 nm by 5 nm when the two apices were separated by 5 nm.

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