변형량 구배 소성론을 사용한 마이크로 크기 소재의 변형해석

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Deformation Analysis of Micro-sized Material using Strain Gradient Plasticity

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Key Words: Micro forming, Intrinsic material length, Finite element analysis, Strain gradient plasticity, Constitutive equation

Abstract : To reflect the size effect of material (1~15m) during plastic deformation of polycrystalline copper, a constitutive equation which includes the strain gradient plasticity theory and intrinsic material length model is coupled with the finite element analysis and applied to plane strain deformation problem. The method of least square has been used to calculate the strain gradient at each element during deformation and the effect of distributed force on the strain gradient is investigated as well. It shows when material size is less than the intrinsic material length (1.54m), its deformation behavior is quite different compared with that computed from the conventional plasticity. The generation of strain gradient is greatly suppressed, but it appears again as the material size increases. Results also reveal that the strain gradient leads to deformation hardening. The distributed force plays a role to amplify the strain gradient distribution.

Finite Element Analysis of Disk Rotation Speed Effect on Dynamic Characteristics of Negative Pressure Hard Disk Drive Air Slider

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하드 디스크 드라이브 음압 공기 슬라이더의 동특성 유한요소해석 - 1. 디스크 회전속도의 영향

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Key Words: Air lubrication(공기 윤활), Finite Element Method(유한요소법), Hard Disk Drive(하드 디스크 드라이브), Perturbation method(교란법).

Abstract : The effect of disk rotation speed on hard disk drive air slider characteristics is studied by using the finite element method. The negative pressure femto sized slider is considered. The perturbation method is utilized to calculate the dynamic coefficients. It is found that increasing the disc rotation speed from 7,200 rpm to 10,800 rpm decreases the air bearing stiffness and damping.