마이크로 쥴톰슨냉동기의 열해석

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Thermodynamic Simulation of a Microscale Joule Thomson Refrigerator

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Key Words: Joule-Thomson Refrigerator(쥴톰슨냉동기), Microchannel(마이크로채널)

Abstract : As the component density of electronics increases due to smaller line width, so does the power dissipation. Microscale Joule-Thomson refrigerator has gained attention in the cooling of electronics due to the its capability of cooling of small spot. A typical microscale JT refrigerator consists of four main compontents; inlet and outlet ports, counter flow heat exchanger, capillary channel and evaporator. The counter flow heat exchanger and capillary channel have serpentine microchannels. Cooling power is generated by the isenthalpic expansion of a gas through the capillary channel, and the performance is kept by counter flow heat exchanger. In this study, Thermodynamic simulations, which are based on the simple Linde-Hampson system, was undertaken to use it to design a microscale JT refrigerator. The results shows the effect of inlet pressure on the cooling capacity. effectiveness, mass flow rate, evaporator temperature.

극초단 펄스 레이저 가공에서 보로노이 다각형 분석법을 이용한 벌크 용융에 대한 분자동력학적 연구

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Molecular Dynamics Study on Bulk Melting Process in Ultrashort Pulsed Laser Processing Using Voronoi Polyhedron Analysis

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Key Words: Bulk melting(벌크용융), Voronoi Polyhedron analysis(보로노이 다면체 분석법)

Abstract : A molecular dynamics study is conducted on ultrashort pulsed laser ablation, which is expected to be a promising tool for micro/nanoscale fabrication in future industry. The simulations have been conducted for silicon atoms described by the Tersoff model with laser fluences 300 ~ 900 J/m2 and pulse durations of 100 fs and 5 ps FWHM. The Voronoi polyhedron analysis is used to investigate bulk melting that has been observed in the simulated results. The Voronoi polyhedron analysis is proved to be an effective tool in many respects for analyzing bulk melting. The relationship between superheating and melting time is derived from the distribution of Voronoi polyhedron properties of the results.