レーザー加工による表面微細構造の撥水特性付与に関する研究

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Hydrophobic properties of laser induced periodic surface structures for ice coring drill

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We investigated hydrophobic properties of a stainless steel and a high-molecular polyethylene using the laser induced periodic surface structures (LIPSS) method. For the surface processing, we used 800 nm wavelength regenerative amplified 100 femto-second plus laser (Ti: sapphire) operated at a repetition rate of 1kHz. The laser intensity is varied from 80 to 360 mJ/cm^2 and the sweep rate is constant at 20 mm/second. To evaluate the hydrophobicity of the surface, we measured a contact angle of water droplets on the surface. As a result of the measurement, the contact angle increased when the stainless steel and the high-molecular polyethylene surfaces was processed. In other words, hydrophobic properties are provided at the surfaces. The optimum laser intensity depends on the materials, the stainless steel and the high-molecular polyethylene, respectively. The hydrophobic property is useful for avoiding adsorbed ice on the stainless steel and the high-molecular polyethylene which is used for a part of our ice coring drill. We believe that the technology can use for the deep ice coring drill to avoid an adsorption of re-frozen ice and water from a deep part of the Antarctic ice sheet.