C1-2.28

smart materials since their flow properties can be easily changed by the imposed magnetic field intensity. The MR fluids can form chain-like structures via magnetization of the particles in the fluid; and it can reversibly transform the fluid from a fluid-like state to a solid-like state within milliseconds. As a result of this transformation, the flow properties of the fluid (such as viscosity and stiffness, etc.) increase due to increased resistance to shear stress according to the imposed magnetic field strength. Owing to such characteristics, the MR fluids can be applied to dampers, clutches, and polishing systems. To use the MR fluid as a polishing media, suitable abrasive particles should be added. In this study, nano-size alumina and ceria particles were used for the polishing of the mica glass ceramics. A series of experiments were performed under various polishing conditions, and the results were investigated. As the results, very fine surface roughness of below Ra=10nm could be obtained.

(A2-038) Thermal conductivity and mechanical property of Si_3N_4 ceramics sintered with CeF_3, LaF_3 additives

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Rare-earth fluorides as additives, comparing with the rare-earth oxides additives, can reduce the amount of oxygen in Si_3N_4 ceramics, and optimize its thermal conductivity. In this paper, Si_3N_4 ceramics was SPSed with CeF_3 and LaF_3 as additives at 1773K respectively and annealed at 2173K in 10MPa N_2 atmosphere. The influence of the type and the amount of additives on thermal conductivity, hardness and strength of Si_3N_4 ceramics was studied. Results show that the thermal conductivity of a sample with CeF_3 is nearly 10% higher than that of the sample with CeO_2, while hardness and strength of the Si_3N_4 are similar. It proves that rare-earth fluoride can greatly affect thermal conductivity of Si_3N_4 ceramics. The strength of the sample with LaF_3 is lower, but thermal conductivity is nearly 15% higher, comparing with the sample with CeF_3 as additives. Microstructure analysis shows that the changes are closely related to the elongated grains in Si_3N_4 ceramics.

(A2-039) Effect of microstructure of SiAlON ceramics on tribological properties

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In designing wear resistant ceramics, it is important to understand the influence of microstructure and material properties on the friction and wear rate. In addressing such issue, a series of fretting wear tests were carried out on a number of SiAlON ceramics, produced from different Si_3N_4 starting powders and densified using both pressureless and gas-pressure sintering routes. The effect of parameters such as starting Si_3N_4 particle sizes, α:β Si_3N_4 phase ratios, seed addition, annealing after sintering on evolution of microstructure, mechanical and tribological properties will be given. Correlations between fracture toughness, hardness, microstructure (e.g. grain size, α:β-SiAlON phase ratios, z values) and wear rate will be presented. Wear mechanisms of developed SiAlON ceramics will be also discussed.

(A2-040) Study on wear resistance of nano ZrO_2 ceramic for hip joint head prostheses

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By using ring-block friction and wear machine, the friction and wear behavior of nano- ZrO_2ceramic test block against GCr15 steel test ring has been studied. The friction and wear test of GCr15 steel ring against 45# steel block has also been conducted for comparison. By using self-made test machine for hip joint friction and wear, the friction test of nano- ZrO_2 ceramic hip joint head against ultra-high molecular weight polyethylene (UHMWPE) acetabulum has been done, the friction test of ultra-high molecular weight polyethylene acetabulum against Co-Cr-Mo alloy hip joint head has also been made for comparison. The result shows that the friction factor of nano- ZrO_2ceramic test block against GCr15 steel test ring is less 37.3% than that of GCr15 steel ring against 45# steel block, the wear weight of nano- ZrO_2ceramic test block against GCr15 steel test ring is only 0.76% of that of GCr15 steel ring against 45# steel block. The wear weight of nano- ZrO_2 ceramic hip joint head against

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