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## **Development of High Functional Bio-Medical Implant Materials by Gas Tunnel Type Plasma Spraying**

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For bio-medical implant, Ti materials and stainless steel have been mainly used. But for long life use, there are some problems for bioactivity. In order to overcome the bioactivity problems, it is useful to coat the surface of the implant by using hydroxyapatite (HA) or other ceramics. One of the effective coating efforts on the implant is plasma spraying.

The gas tunnel type plasma system developed by the author has high energy density and also high efficiency. One typical application is the plasma spraying of ceramics such as Al<sub>2</sub>O<sub>3</sub> and ZrO<sub>2</sub>. The characteristics of these ceramic coatings by the gas tunnel type plasma spraying were superior to those by conventional jets. The Vickers hardness of this sprayed coating became 20-30% higher than that of conventional plasma sprayed coating. And, the porosity was only half of the value of the conventional ones.

In this study, gas tunnel type plasma spraying was successfully employed to produce HA and YSZ reinforced HA coatings on 316L stainless steel substrate. The reinforcement of YSZ in HA significantly reduced the porosity and consequently increased the coating hardness and enhanced the adhesive strength. The potentiodynamic polarization and impedance measurements showed that YSZ reinforced HA coatings have superior corrosion resistance compared to the pure HA coating in SBF solution. The cell culture results revealed that the reinforced YSZ coating has improved the bioactivity of the HA coatings. The cells used in the culture test were the marrow stromal cells (MSCs) of male SD rats. These results indicated the good bioactivity of above coating materials.

### **Keywords**

Bio-medical implant

Bioactivity

YSZ

HA

Gas Plasma Spraying