

## SMART COATING TECHNOLOGY BY GAS TUNNEL TYPE PLASMA SPRAYING

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**Abstract.** Nano-science & technology is one of the most important scientific fields, and the material processing using the nano-technology is now advanced towards more precise and controllable smart stage. Regarding thermal processing, an important key should be the performance of the applied heat source. A plasma is fundamentally the most superior heat source, because of high temperature, high energy density, easy controllable, etc. Therefore more precious plasma system has been expected for smart thermal processing. The gas tunnel type plasma system developed by the author has high energy density and also high efficiency. The concept and the feature of this plasma system are explained and the applications to the various thermal processing are described in this report.

One practical application is plasma spraying of ceramics such as  $\text{Al}_2\text{O}_3$  and  $\text{ZrO}_2$ . The characteristics of these ceramic coatings were superior to the conventional ones. The  $\text{ZrO}_2$  composite coating has the possibility of the development of high functionally graded TBC (thermal barrier coating). Another application of gas tunnel type plasma is surface modification of metals. For example the TiN films were formed in a very short time of 5 s.

Now, advanced plasma application of spraying methods as a smart coating technology is expected to obtain the desired characteristics of ceramics such as corrosion resistance, thermal resistance, and wear resistance by reducing the porosity and increasing the coating density. One application of the smart coating technology is a formation of the metallic glass coating with high function, and another is Hydroxiapatite coating for bio-medical application. The formation process of those coatings and the coating characteristics were investigated in this study.