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Yong Yang, Yu-hang Cui, Lu-lu Miao, You Wang, Wei Tian, Yu-duo Ma, Xia Zhang, Chen Zhang, Xue-guang Chen, Lei Wang, Yan-chun Dong, Xue-rui Dai



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## Effects of treatment process and nano-additives on the microstructure and properties of Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> nanocomposite powders used for plasma spraying

Yong Yang <sup>a,\*</sup>, Yu-hang Cui <sup>a</sup>, Lu-lu Miao <sup>a</sup>, You Wang <sup>b</sup>, Wei Tian <sup>b</sup>, Yu-duo Ma <sup>a</sup>, Xia Zhang <sup>a</sup>, Chen Zhang <sup>a</sup>, Xue-guang Chen <sup>a</sup>, Lei Wang <sup>a</sup>, Yan-chun Dong <sup>a</sup>, Xue-rui Dai <sup>a</sup>

a. Key Lab. for New Type of Functional Materials in Hebei Province, School of Materials Science and Engineering, State Key Laboratory of Reliability and Intelligence of Electrical Equipment, Tianjin Key Laboratory of Materials Laminating Fabrication and Interface Control Technology, Hebei University of Technology 300132, Tianjin, China

b. Department of Materials Science, Harbin Institute of Technology, Harbin 150001, China

\*Corresponding author: Yong Yang; Tel: +86-22-60204810; Fax: +86-22-26564810; E-mail: yangyonghebut@163.com, yangyong@hebut.edu.cn.

Postal address: No. 29 Guangrong Road, Hongqiao District, Tianjin 300132, P.R. China

### Abstract:

Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> nanocomposite powders with or without nano-additives used for plasma spraying were successfully prepared by spray drying, heat treatment and plasma treatment. The effects of treatment process and nano-additives on the microstructure and properties of Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> nanocomposite powders were investigated. Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> composite powders prepared by spray drying and heat treatment were nanostructured composite powders with high sphericity and nanosized grains. Spherical and dense particles with smooth surface were formed due to the extremely rapid liquid phase sintering during plasma treatment. The formation of different microstructures after plasma treatment was mainly determined by two key factors: the density and heating temperature of powder particles. The three-dimensional network structure was the typical microstructure in the plasma treated Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> composite powder with nano-additives. The nanocomposite powder with three-dimensional network structure was composed of amorphous intergranular network thin film rich in Ti, Zr and Ce surrounding the  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> colonies. Spherical powders with smooth surface and dense microstructure were formed due to the rapid melting and solidifying of plasma

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