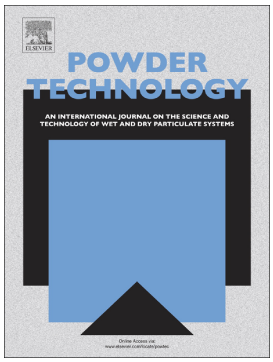

Effects of treatment process and nano-additives on the microstructure and properties of Al2O3-TiO2 nanocomposite powders used for plasma spraying

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PII: S0032-5910(18)30535-7
DOI: doi:10.1016/j.powtec.2018.07.038
Reference: PTEC 13520

To appear in: *Powder Technology*

Received date: 15 March 2018
Revised date: 4 July 2018
Accepted date: 9 July 2018

Please cite this article as: 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 , Effects of treatment process and nano-additives on the microstructure and properties of Al2O3-TiO2 nanocomposite powders used for plasma spraying. Ptec (2018), doi:10.1016/j.powtec.2018.07.038

Effects of treatment process and nano-additives on the microstructure and properties of Al_2O_3-TiO_2 nanocomposite powders used for plasma spraying

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Abstract:

Al_2O_3-TiO_2 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_2O_3-TiO_2 nanocomposite powders were investigated. Al_2O_3-TiO_2 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_2O_3-TiO_2 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 α-Al_2O_3 colonies. Spherical powders with smooth surface and dense microstructure were formed due to the rapid melting and solidifying of plasma