Powder Technology

Surface characterization and formation mechanism of the ceramic $TiO_{2-x}N_x$ spherical powder induced by annealing in air

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Mechanism for the formation of titanium oxynitride (TiO(sub2)-(subx)N(subx)) on the surfaces of spherical Ti powder particles upon heat treatment in air at 500, 600, 700 and 800 °C was investigated. The results showed that the first at 500 °C a hexagonal closed packed (HCP) TiO(subx) film was formed while aTiO2 film was observed after annealing at 600 °C and eventually a TiO(sub2)-(subx)-N(subx) layer coated the spherical Ti particles at 700 and 800 °C due to N diffusion within the TiO(sub2) crystal lattice. The resulting surface structure was studied by means of x-ray diffraction (XRD) while the surface morphology of the powders was characterized using the scanning electron microscope (SEM) attached with energy dispersive x-ray spectroscopy (EDS) detector. The AFM images confirmed that when the N content increases (800 °C-heat treated sample) the powder loses its triangular grains (700 °C-annealed sample) to irregular shaped grains.