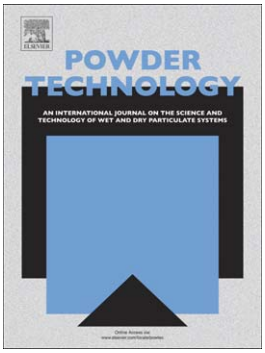

Low temperature synthesis of nanoscale titanium nitride via molten-salt-mediated magnesiothermic reduction

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Low temperature synthesis of nanoscale titanium nitride via molten-salt-mediated magnesiothermic reduction

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Abstract: We investigate a new method for the synthesis of nanoscale titanium nitride via a molten-salt-mediated reduction route; the reaction was carried out at a temperature of 600–1100 °C for 1–7 h in a nitrogen atmosphere using TiO_2 and Mg powders as starting materials. The effects of the TiO_2/Mg mole ratio, reaction temperature, reaction time and salts on the formation of TiN were studied. The phase composition, morphological structure, and particle size of the TiN powder were characterized by X-ray diffraction, scanning electron microscopy, transmission electron microscopy, and a Brunauer–Emmett–Teller specific-surface-area analysis. The results showed that the as-synthesized TiN crystals were approximately 5–30 nm in size and the specific surface areas of the TiN particles were 76.47–93.09 m^2/g, higher than the 9.83 m^2/g of the raw TiO_2. A possible reaction mechanism for the formation of TiN powder in molten salt is proposed.

Keywords: titanium nitride; phase morphology; molten salt; reaction mechanism

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