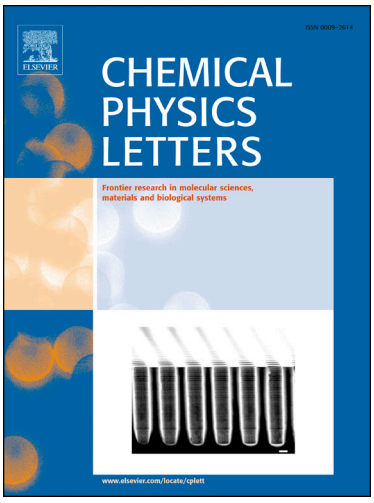


Research paper

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# Rutile Nanopowders for Pigment Production: Formation Mechanism and Particle Size Prediction

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## Abstract

Formation mechanism and particle size prediction of rutile nanoparticles for pigment production were investigated. Anatase nanoparticles were observed by oriented attachment with parallel lattice fringe spaces of 0.2419 nm. Upon increasing the calcination temperature, the (1 1 0) plane of rutile was gradually observed, suggesting that the anatase (1 0 3) planes undergo internal structural rearrangement of oxygen and titanium ions into rutile phase due to ionic diffusion. Backpropagation neural network was used to predict particle size of rutile nanopowders, the prediction errors were all smaller than 2%, providing an efficient method to control particle size in pigment production.

**Keywords:** Rutile phase nanopowders; Formation; Particle size prediction; BP neural network;

## 1 Introduction

Titanium dioxide ($TiO_2$) is used in a wide range of applications due to its excellent chemical stability, biological non-toxicity and low cost. The rutile and anatase phases of $TiO_2$ are commonly used as white pigments although their