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Manipulation of morphology of strontium titanate particles by spray pyrolysis

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Abstract. Strontium titanate (SrTiO_3) materials are used in industrial applications such as catalyst supports, solid oxide fuel cell anodes, and red-emitting phosphors, and these applications require different particle morphologies, either porous or solid. Spray pyrolysis (SP) is a potential process for preparing SrTiO_3 because it is simple and continuous, but to date, no solid spherical shape has been reported. One possible challenge is the instability of the precursor solution, which can cause non-homogenous precipitation of porous structures. In this study, precursors with various concentrations of a new additive, acetic acid, were chosen for the preparation of SrTiO_3 particles. The resulting particles were observed to have three main morphologies: bumpy solid, bumpy porous, and wrinkled porous. The experimental results suggest that the morphological formation mechanisms are highly correlated with esterification behaviors, which is controlled by the additive concentration of acetic acid. In summary, the SP formation mechanisms of SrTiO_3 particles identified in this study could be used to control particle morphology for industrial applications.

Keywords: Strontium titanate; Spray pyrolysis; Morphology; Scanning electron microscopy; Transmission electron microscopy

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