

Experimental Factorial Designs to Produce Niobium Precursor by Spray Drying Process

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Abstract

Spray drying has become the most important technique for dehydrating fluids to obtain powders, and is used extensively in the pharmaceutical and chemical industries for generating fine powders by thermodynamics of air-water, however, powders characteristics depend on the device setup, that is classified as not conventional due to your lateral heating. It is needed investigate the most influent variables and its significance to setup the spray dryer to produce continuously a fine and uniform powder, then several experimental factorial designs are built to study the effects of five parameters on production of spray-dried ammonium niobium-oxalate precursor. The effects are temperature, colloid concentration, colloid rate, air rate and air excess rate. The main purpose of the study is to optimize the operating conditions to maximize production while minimizing moisture contents. Then, the optimal operating conditions are estimated by response surface methodology, the results are applied to evaluate both the repeatability and reproducibility of the spray-drying technique. The optimal conditions are used to synthesizing NbC at low temperatures, about 950°C, through a decomposition reaction of the fine powder obtained at CH₄/H₂ atmosphere.