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Extended Abstract

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Chemistry Congress: 2017 Synthesis of cobalt ferrite nanoparticles by means of confined impinging-jets reactors- Abiev RS

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The process of synthesis of cobalt ferrite using confined impact jets has been studied experimentally at relatively low temperatures (20 ° C to 30 ° C) and ambient pressure. Unlike hydrothermal synthesis, usually carried out at high pressures and temperate temperatures (400 ° C to 450 ° C), the synthesis of impact jets makes it possible to produce small particles (about 8 nm in average) in a few milliseconds. . Due to a rapid and effective mixing of the reagents of short contact, it was possible to avoid the formation of co-products and to exclude the growth of crystalline lenses. A thermoplastic urethane system in an injection-reaction molding process developed by Kolodziej on the impact mixing of microstructures. Three levels of impact mixing ranging from Re = 80 to Re = 210 were carried out by a laboratory injection and reaction molding device (RIM). The samples were characterized by different methods: gel permeation chromatography, differential scanning calorimetry (DSC), optical microscopy and transmission electron microscopy. Hard segment globules, hard segment spherulites, and soft segments of a matrix richness have been observed in participants with morphologies. The multiple DSC endotherms were linked to different crystal structures.

The neochelometry of markers was used by Becker to study the concentration fields of two impact jet mixing systems: 1) two opposite turbulent round jets (along a straight line) colliding, and 2) an incoming turbulent round jet colliding. axis. The impact or deviation zones were at the center of the study, as well as the concentration fields, and their intensity of fluctuation. The results could be applied to heat and mass transfer devices from chemical reactors and combustion chambers.

Chemical methods for the production of oxide nanoparticles, including the nanopowders of CoFe2O4, are widely used in industrial practice consistency of precipitation reactions from polyvalent metals through their salts. It is possible, by controlling the pH and temperature of the solutions, to create optimal precipitation conditions at which rate of crystallization increases, resulting in highly dispersed hydroxide. Then, the products are the corresponding oxides of the formation until they are tempered. The nanopowders are produced by this technology with sizes between 10 and 100 nm, and their shape is close to spherical.

A hydrothermal method has been used extensively in recent years to produce nanometric oxides, which can be controlled by dispersed producers of varying process parameters (temperature, pressure, composition of the solution and dedicated gravy. Nanometric oxide particles are used in the manufacturer of catalysts, functional and structural ceramics, versatile applications for composites

The flow rate is a CIJ mixer studied by Ashgriz with PLIF. Two key aspects influencing the flow regimes and the quality of the study were: Reynolds number of jets (Re) in the range 50 <Re <600; and the effect of the impedance of the flow on the jets, maintaining the flow of one of the injectors fixed and varying the other. The mixing mechanisms and scales are the obtained flows of the images from the study, and the degree of mixing is quantified from the intensity of the calculation. Under balanced flow conditions, when the best mixing performance is observed, three flow regimes are observed: for Re <103, the two feed streams of complete segregation with the flow are stable; for Re = 104, the flow shows an oscillatory periodic laminar flow regime; for Re> 104, The flow evolves toward a strong mixing dynamic with a self-sustaining chaotic laminar regime. With the increase in Re, we observed the formation of smaller mixing scales in the flow and an increase in the quality of the mixture.

The visualized mixing scales are the estimated thickness of striking thicknesses for existing theoretical models. It was concluded that, in the flow regimes studied, the turbulent diffusion of the statistical theory does not provide a realistic physical description of the flow. In addition, the jets of the mass flow in the imbalance are shown by Fonte et al. There is always a mixture of quality that is negatively impacted, even when the impulse in the flow results in an increase in the number of jets, thereby increasing the amount of energy supplied to the system. The results of this work show that the vortex engulfing mechanism is favored by two jets with a chaotically oscillating impact, the laminar regime, which is a key aspect of mixing by cijs.

Consequently, the use of the CIJ reactor method makes it possible to fabricate nanostructured crystalline particles in a continuous process with a reduced energy consumption, thus making it possible to use this method on an industrial scale. In addition, the leakage of autoclaves, ovens and supercritical reactors led to a significant drop in the cost of equipment. The reagents of the almost instantaneous contact, their rapid and efficient mixing result in a high selectivity and a yielding process.

In the flow field, a 2D jet mixer was simulated by Santos to study the effect of pulsation / modulation on the dynamics of the jet flow. The opposite jets were tested for the flow of different frequencies and amplitudes. Modulation frequencies have been defined as the dynamic flux of the natural oscillation frequencies of multiples. The natural flow frequencies are determined from the non-forced flow, that is, when the jets are not modulated. Santos observed that phase modulation of the opposite jets, with frequencies close to natural frequencies, causes a resonance of the flow order of the system, which results in a gene with a flow field. Conversely, enhanced, i.e., the vortices evolution throughout the T-jets mixers was found less repetitive.

The impact of the jets flow rate modulation on the flow field dynamics increases with the modulation amplitude up to the extreme case where it completely changes the dynamics of the system. An equation for the most energy efficient pulsation of the jets feed streams in opposed jets mixers is proposed in the work of Santos

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