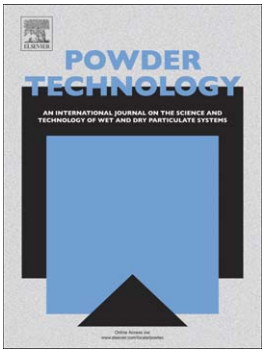

One-step solvent-free mechanochemical synthesis of metal iodate fine powders

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One-step Solvent-free Mechanochemical Synthesis of Metal Iodate Fine Powders

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ABSTRACT: Metal iodates are strong iodine rich oxidizers which can be used in the formulation of biocidal energetic materials. Generally, metal iodates particles were synthesized by chemical precipitation methods with a large size distribution. In this work, we developed a one-step and solvent-free, high yield method to synthesize metal iodate fine powders by mechanochemistry. Compared to the conventional chemical precipitation method, the size of final products can be reduced by 20-500 times. The method generates particles with a narrower size distribution and high yield, and is sufficiently generic as to enable creation of a variety of metal iodates including $AgIO_3$, $Ca(IO_3)_2$, $Mn(IO_3)_2$ and $Cu(IO_3)_2$. Moreover, the synthesis is conducted in the solid states with little to no solvent. The role of process conditions (temperature, hydration state, and milling time) on reaction products was investigated by TG/DSC and XRD. We believe that crystalline water bound to the metal nitrates precursor lowers the Tammann's temperature sufficient to unbind water so as to promote ion diffusion and thus facilitate reaction in the absence of a solvent. The reaction is promoted by the milling process which attrits the particles to expose fresh unreacted surfaces and reduces particle size.