

Accepted Manuscript

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

Haiyang Wang, Jeffery B. DeLisio, Tao Wu, Xizheng Wang, Michael R. Zachariah

PII: S0032-5910(17)30823-9
DOI: doi:[10.1016/j.powtec.2017.10.024](https://doi.org/10.1016/j.powtec.2017.10.024)
Reference: PTEC 12882

To appear in: *Powder Technology*

Received date: 23 June 2017
Revised date: 2 October 2017
Accepted date: 8 October 2017



Please cite this article as: Haiyang Wang, Jeffery B. DeLisio, Tao Wu, Xizheng Wang, Michael R. Zachariah, One-step solvent-free mechanochemical synthesis of metal iodate fine powders, *Powder Technology* (2017), doi:[10.1016/j.powtec.2017.10.024](https://doi.org/10.1016/j.powtec.2017.10.024)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

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

Haiyang Wang, Jeffery B. DeLisio, Tao Wu, Xizheng Wang, Michael R.

Zachariah*

Department of Chemical and Biomolecular Engineering and Department of Chemistry and Biochemistry, University of Maryland, College Park, Maryland 20742, United States

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 , $\text{Ca}(\text{IO}_3)_2$, $\text{Mn}(\text{IO}_3)_2$ and $\text{Cu}(\text{IO}_3)_2$. 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 Tamman'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.

Download English Version:

<https://daneshyari.com/en/article/6675774>

Download Persian Version:

<https://daneshyari.com/article/6675774>

[Daneshyari.com](https://daneshyari.com)