



**HAL**  
open science

## Nanomaterials Processed by Spark Plasma Sintering

Faming Zhang, Bikramjit Basu, Lianjun Wang, Izabel Fernanda Machado,  
Claude Estournès

► **To cite this version:**

Faming Zhang, Bikramjit Basu, Lianjun Wang, Izabel Fernanda Machado, Claude Estournès. Nanomaterials Processed by Spark Plasma Sintering. *Journal of Nanomaterials*, 2013, vol. 2013, pp. 1-1. 10.1155/2013/346952 . hal-01130614

**HAL Id: hal-01130614**

**<https://hal.science/hal-01130614>**

Submitted on 12 Mar 2015

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



## Open Archive Toulouse Archive Ouverte (OATAO)

OATAO is an open access repository that collects the work of Toulouse researchers and makes it freely available over the web where possible.

This is an author-deposited version published in: <http://oatao.univ-toulouse.fr/>  
Eprints ID: 13603

**Identification number:** DOI: 10.1155/2013/346952

Official URL: <http://dx.doi.org/10.1155/2013/346952>

**To cite this version:**

Zhang, Faming and Basu, Bikramjit and Wang, Lianjun and Machado, Izabel Fernanda and Estournès, Claude *[Nanomaterials Processed by Spark Plasma Sintering](#)*. (2013) Journal of Nanomaterials, vol. 2013. pp. 1-1. ISSN 1687-4110

Any correspondence concerning this service should be sent to the repository administrator:  
[staff-oatao@inp-toulouse.fr](mailto:staff-oatao@inp-toulouse.fr)

## Editorial

# Nanomaterials Processed by Spark Plasma Sintering

**Faming Zhang,<sup>1</sup> Bikramjit Basu,<sup>2</sup> Lianjun Wang,<sup>3</sup>  
Izabel Fernanda Machado,<sup>4</sup> and Claude Estournès<sup>5</sup>**

<sup>1</sup> *Physics of New Materials, Institute of Physics, University of Rostock, 18055 Rostock, Germany*

<sup>2</sup> *Materials Research Center, Indian Institute of Science (IISc), Bangalore 560012, India*

<sup>3</sup> *College of Materials Science and Engineering, Donghua University, Songjiang District, Shanghai 201620, China*

<sup>4</sup> *Departamento de Engenharia Mecatrônica e Sistemas Mecânicos, Escola Politécnica da Universidade de São Paulo, 05508-900 São Paulo, SP, Brazil*

<sup>5</sup> *Institut Carnot CIRIMAT (UMR 5085 CNRS-UPS-INP), Université Paul Sabatier, 118 Route de Narbonne, 31062 Toulouse Cedex 09, France*

Correspondence should be addressed to Faming Zhang; [faming.zhang@uni-rostock.de](mailto:faming.zhang@uni-rostock.de)

The spark plasma sintering (SPS), a variant of field-assisted sintering (FAST) or pulsed electric current sintering (PECS), is a novel pressure assisted pulsed electric current sintering process, which utilizes ON-OFF DC pulse energizing. Due to the repeated application of an ON-OFF DC pulse voltage and current flow between powder particles, the spark discharges and the Joule heating (local high temperature state) are therefore dispersed to the overall specimen. The SPS process is based on the electrical spark discharge phenomenon and is a high efficient, energy saving technique with a high heating rate and a short holding time. The problem of rapid grain growth of nanomaterials during conventional sintering can be inhibited to a larger extent by using the SPS technique. The SPS can be used for diverse novel bulk material applications, but it is particularly suitable for the processing of nanomaterials. Despite such anticipated advantages, the optimization of the process window (heating rate-temperature-time) in SPS process is a challenging task. More importantly, the underlying mechanisms for superfast densification still remains to be explored.

In the above perspective, this special issue contains some peer-reviewed research papers, which address some of the exciting issues or illustrate new nanomaterials development using SPS. This special issue's papers are all very much of the "head up" variety. First D. V. Dudina and A. K. Mukherjee reviewed the reactive SPS on the successes and challenges of

nanomaterial synthesis. Secondly, some work on bioceramics is covered, for example, antimony-doped tin oxide nanoceramics (J. Wu et al.). Additionally, we look to some works on the nanostructured metals, for example, nanostructured nickel (F. Naimi et al.) and FeAl alloys (S. Paris et al.). In the end, the SPS of nanocomposites is also introduced, for example, graphene/Bi<sub>2</sub>Te<sub>3</sub> thermoelectric materials (B. Liang et al.) and Ti-ZrO<sub>2</sub> functionally graded materials (M. Jayachandran et al.).

This field of "nanomaterials processed by SPS" develops very fast. This special issue is just a tip of the iceberg, but we also can conjure up the whole thing through seeing a part of it.

We thank all the authors for their contribution to the literature on SPS.

*Faming Zhang  
Bikramjit Basu  
Lianjun Wang  
Izabel Fernanda Machado  
Claude Estournès*