SCIENCES SORBONNE UNIVERSITÉ

2021-2022

Master thesis proposal

Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie

Campus Pierre et Marie Curie
Tower 23 - 4th floor -23-22
Director: Marco Saitta

Title: Elaboration of Light ceramics Based on Boron Phosphide for industrial Applications

Keywords: hard material, boron phosphide, mechanosynthesis

Scientific description:
The objective of this project is to develop new dense ceramics with controlled microstructures, composed of boron phosphide phases (BP or B12P2), in order to evaluate and interpret their damage mechanisms under impact. For this, it is necessary to master new skills around the process for the production of ceramics:
- The production of powder ceramics based on BP or B12P2 phases. The control of the particle size and the purity of the powders (BP / B12P2 ratio, residual oxide and / or metallic phases) constitutes the key point of this study. This work will be based in particular on the optimization of mechanochemistry method, which will allow access to micrometric or even submicronic particles.
This synthesis will lead to better understand and quantify the parameters for scale up the quantity of BP and B12P2. Mechanosynthesis and purification by etching acid will be carry on in order to define the characteristics (size distribution, grain size, specific surface, purity) for further SPS (Spark Plasma Sintering) treatment. Repeatability of the process is a key result.
Samples will be sintered and characterized by conventional technics such as XRD, microscopy and Raman spectroscopy. Hardness will be also measured on the sintered sample.

Techniques/methods in use: ball milling, mechanosynthesis, etching acid, XRD, SEM, EDX, Raman
Applicant skills: chemistry and physic skill, laboratory experimental work
Industrial partnership: Y/~~N~~ (specify the company) Potential interest by CTTC.

Internship supervisor(s) (name, email, phone, webmail): Hicham Moutaabbid, hicham.moutaabbid@sorbonne-universite.fr, 0144275897, Yann Le Godec, yann.le_godec@sorbonne-universite.fr, 0144274459
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Possibility for a Doctoral thesis: Y/N (specify if already financed) **Y.**