

## NEW INNOVATIVE SYNTHESSES OF BORON PHOSPHIDE

Breakthrough syntheses of boron phosphide, a new class of hard materials : fast, safe, reproducible, and scalable syntheses

### APPLICATIONS

- Wear parts
- Wear-resistant coating
- Cutting tools

### DEVELOPMENT PHASE

Syntheses are efficient at laboratory scale, industrial upscaling proven.

Ongoing basic sintering of boron phosphide powders

### INTELLECTUAL PROPERTY

2 patent families : WO2015097244,  
WO2016184608

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**Boron phosphide ■ BP ■ B<sub>12</sub>P<sub>2</sub> ■ Synthesis ■ SHS ■ Mecanochemistry ■ High hardness ■ Hard material**

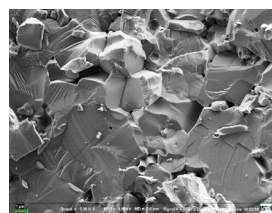
### PRESENTATION

Boron phosphides (BP and B<sub>12</sub>P<sub>2</sub>) are characterized by high hardness (Hv > 30GPa), low density, high thermal conductivity and a high thermal and chemical stability (up to 1500K in air).

They can be used in many industries including automotive, mechanical engineering and mining as cutting tools, construction part or wear-resistant coatings.

However, these promising two materials are not yet industrially used because of the lack of mass production method. Currently polycrystalline boron phosphides powders are traditionally synthesized by slow processes requiring toxic and aggressive reagents and high energy.

Two new approaches of producing boron phosphide powders have been discovered and patented. These 2 processes, SHS (Self-Propagating High-Temperature Synthesis) and mecanochemistry, enable to synthesize either BP or B<sub>12</sub>P<sub>2</sub> nanopowders with high purity (>97%), from readily available and non-toxic reagents. These new fast, safe, reproducible and scalable syntheses now enable the development of a wide use of boron phosphides.



*Scanning Electron Microscopy photograph of sintered boron phosphide © Université Pierre et Marie Curie*

### COMPETITIVE ADVANTAGES

- Rapid synthesis
- Nontoxic and available reagents
- High reproducibility
- High purity of the synthesized product
- Potential for easy industrial implementation and low cost synthesis