The production of hard alloys by mechanical synthesis and SPS

To develop nanocrystalline composites based on WC-Co with a grain size <100 nm

Steps of development:
1. A nanocrystalline powder of tungsten carbide;
2. A binder doped with inhibitors;
3. A nanocrystalline composite with a mean grain size of WC-Co of less than 100 nm;
4. Understanding of the mechanisms of strengthening and hardening by the evaluation of microstructures and by mechanical tests.

Mechanical Alloying (MA) is a powder processing technique in the solid state, involving repeated welding, fracturing and rewelding of powder particles in a high energy ball mill.

- Cobalt powder appearance after 40 minutes of milling. (MEB 100X).
- Cobalt powder appearance after 40 minutes of milling. (MEB 1000X)
- Cobalt powder appearance after 40 minutes of milling, in section. Nital 10% etching. (MO 500X)
- The structure is formed by the welding of several fine particles during grinding process.

The -0,063 mm fraction evolution during milling process from 195 g of starting material.