



Effect of SPS sintering on WC-Co powder densification

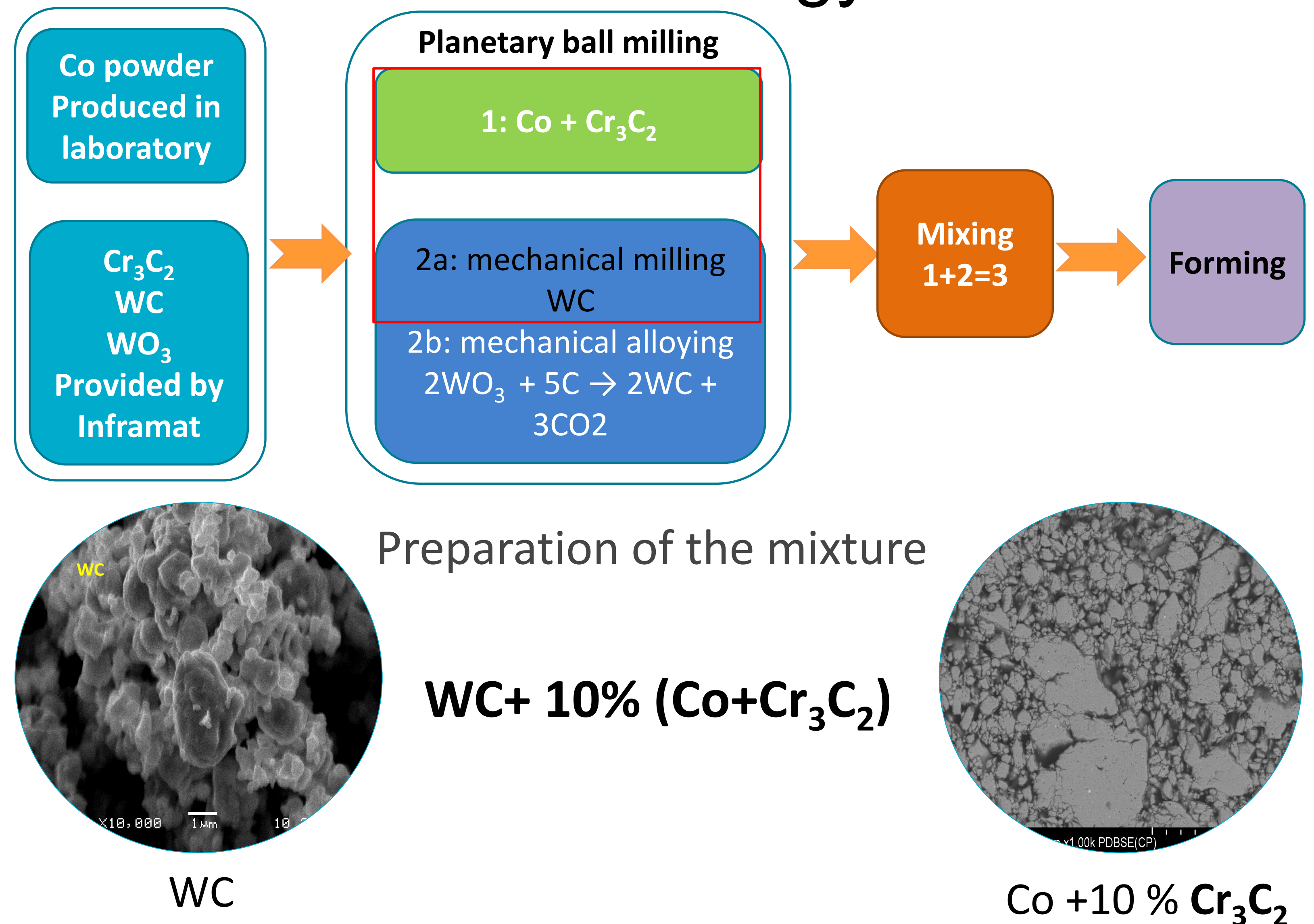
Abstract

In cemented carbides based on ultrafine carbide powders, the use of growth inhibitors is indispensable for the preservation of satisfactory mechanical properties of sintered product. The inhibitors manifest their effect by blocking tungsten carbide diffusion through the metal binder. Use of chromium carbide as inhibitor has proved very effective, especially by ensuring a high toughness for the alloys where it is used. An homogeneous distribution and a lower inhibitor particle size are the premises to obtain a uniform microstructure. This study was aimed at studying the effect of a doped binder on the hardness and densification of a WC-Co alloy. The samples were sintered by SPS technique. Samples were studied by X-ray diffraction, optical and electron microscopy on polished samples. The hardness was measured by Vickers method under a load of 30kg.

Factors influencing the milling process

- Rotation speed
- Balls weight
- Balls / powder ratio

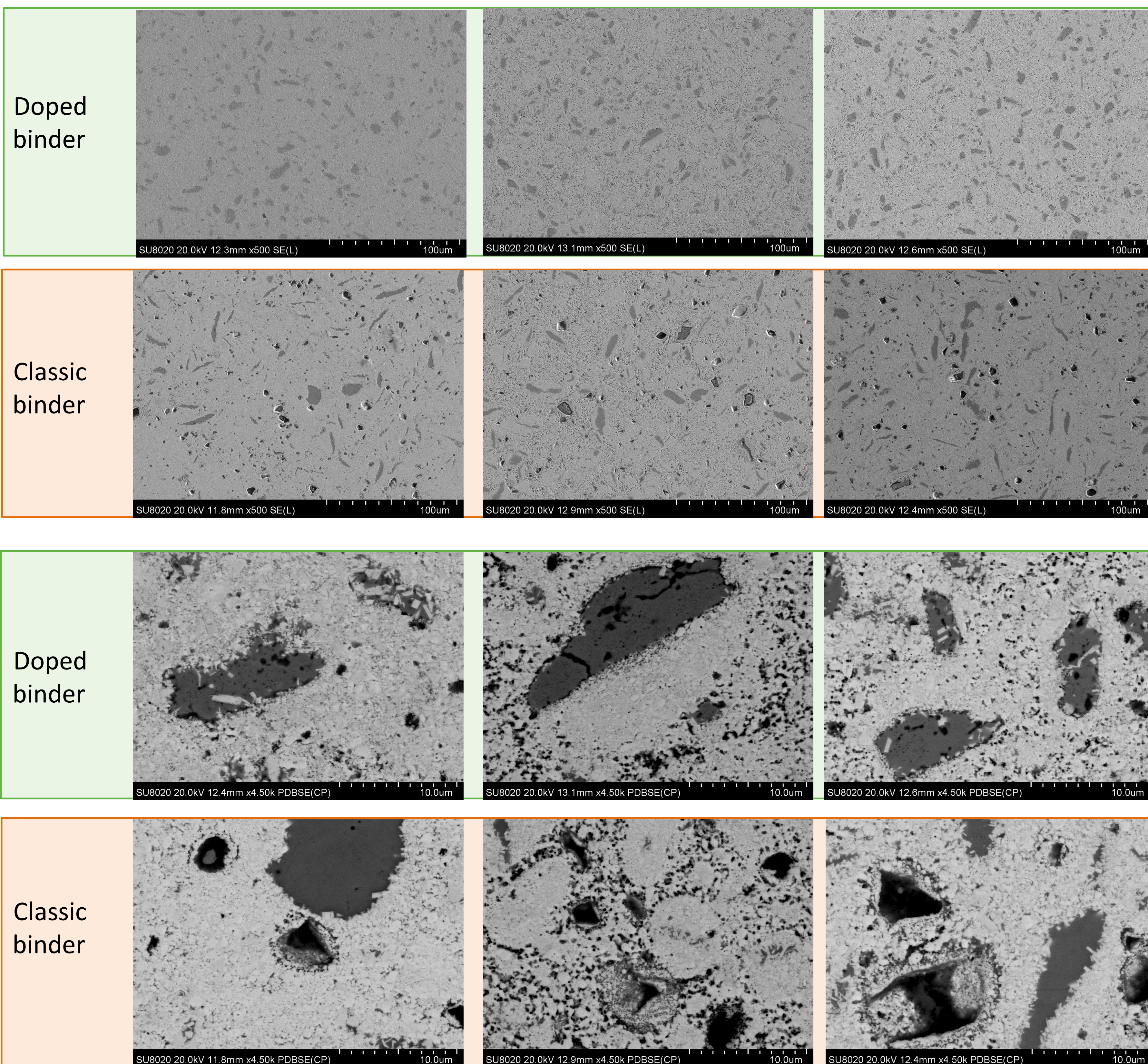
Methodology



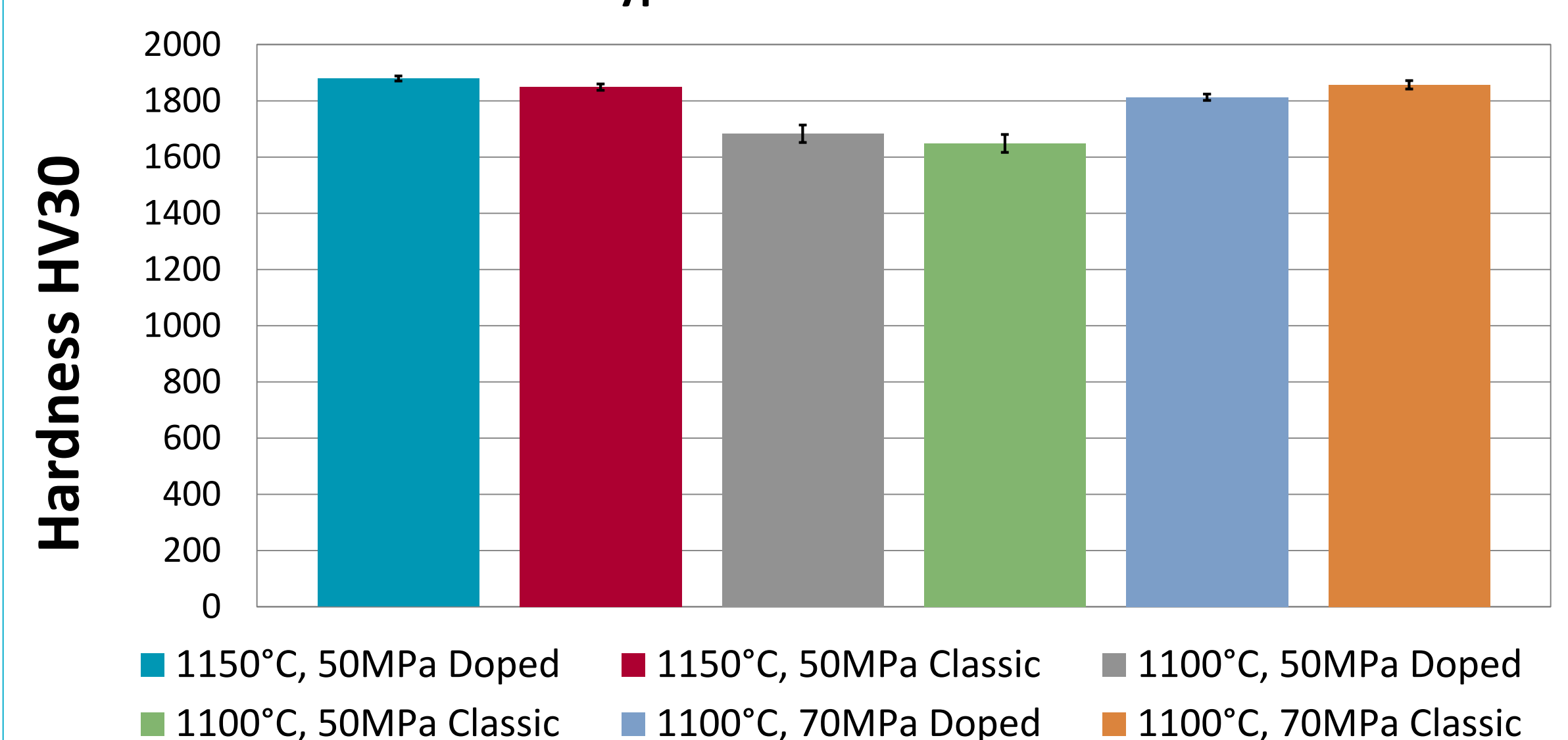
1150°C, 50 MPa

1100°C, 50 MPa

1100°C, 70 MPa



Binder type influence on hardness



Conclusions

The work is part of a series of tests that are carried out to understand the impact of sintering temperature and pressure on the hardness and densifications of tungsten carbide-cobalt alloys.

The goal is to fully optimize the cemented carbides production by mechanical alloying.

- The doped binder provides a complete densification after sintering at 1150°C;
- In the conventional binder mixtures, the porosity is high;
- At a temperature of 1100°C the densification is not as good and the hardness decreases sharply;
- The increase in pressure applied at 1100°C increases hardness up to the values obtained at 1150°C but without reducing the porosity.

In the tested sintering conditions it can be said that the use of a previously doped binder ensures a total densification at the temperature of 1150°C and a pressure of 50 MPa. The microstructure is not totally homogeneous, a better homogenization of the binder with the tungsten carbide powder is necessary.

Acknowledgements and Contact

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Faculté Polytechnique de Mons, Service de Métallurgie Rue de l'Epargne 56, 7000 Mons, Belgique