

# Processing of WC based composites with low Ni addition by colloidal processing routes

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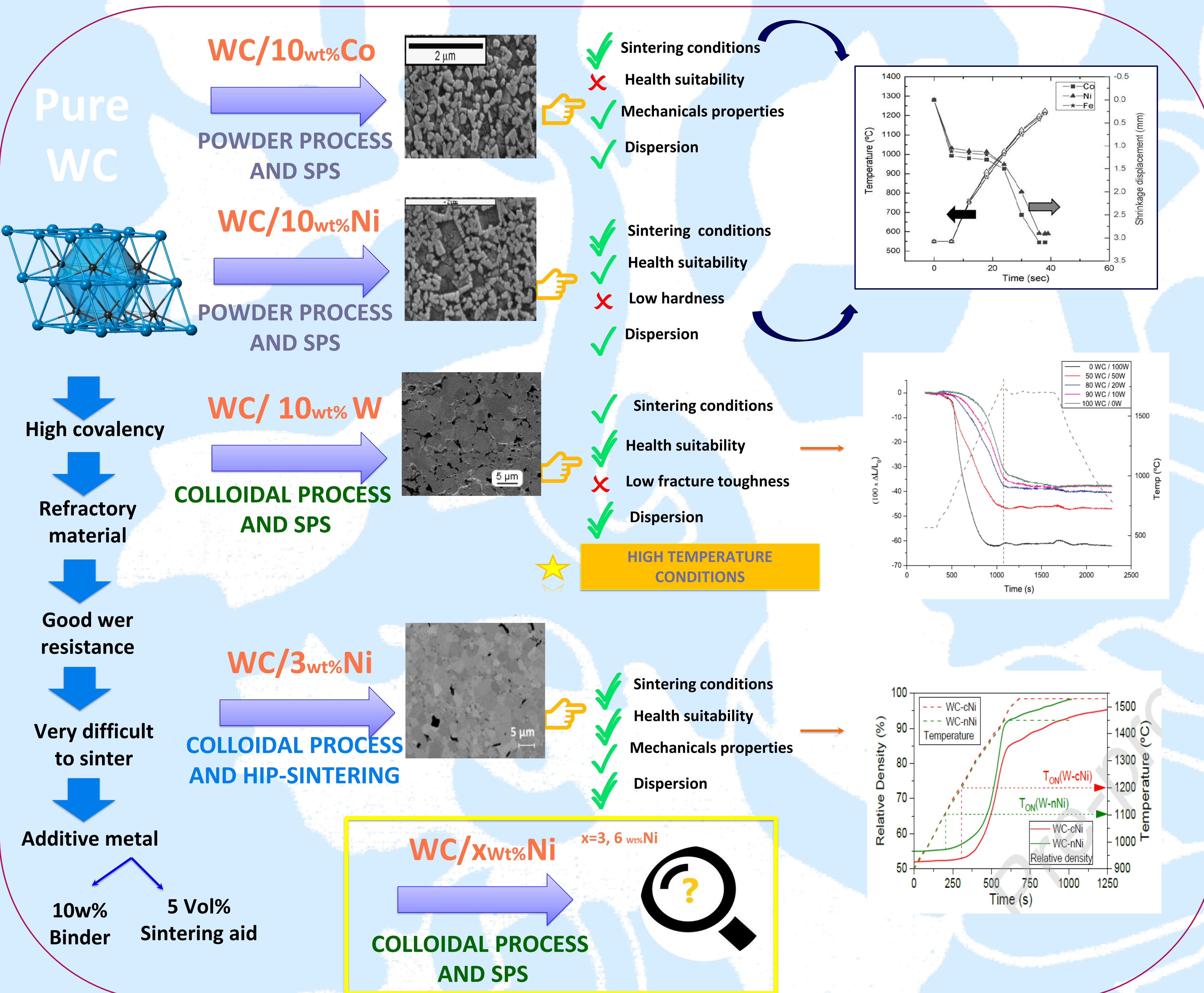
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## Abstract

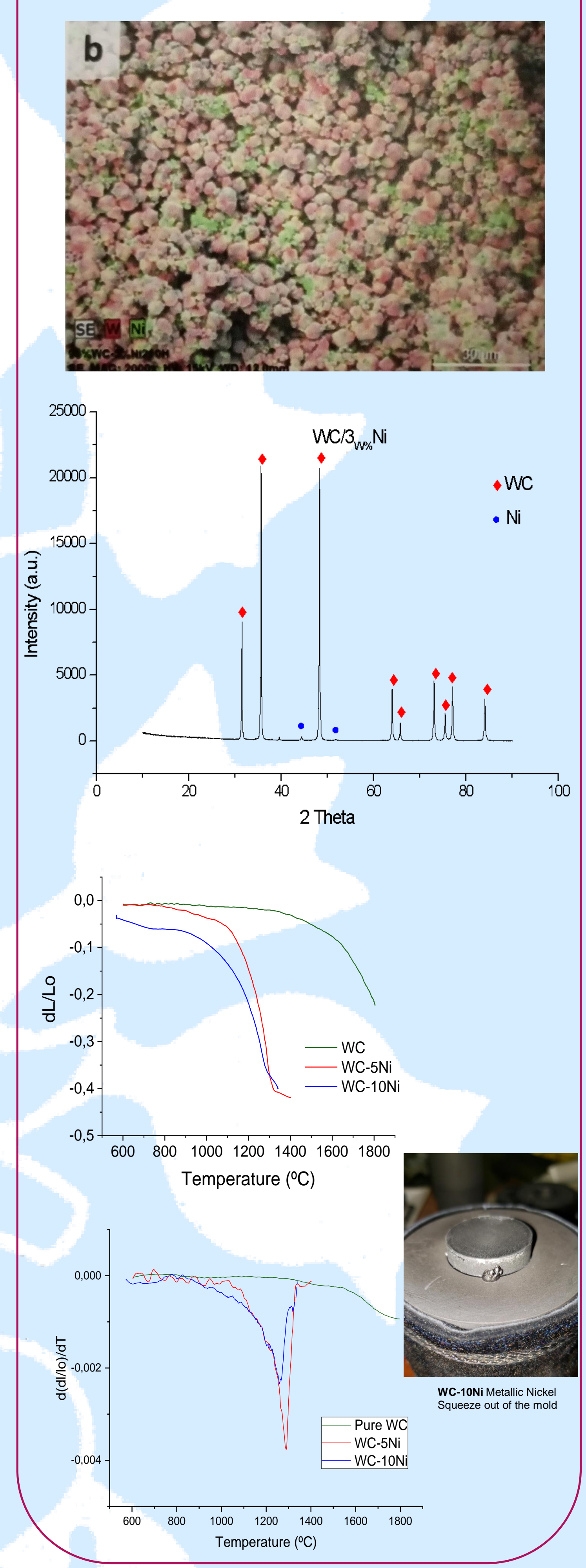
In this work, colloidal processing is chosen to process powders due to the excellent dispersion. By this route WC with a small amount of nickel (3 and 6 vol%). These compositions soft the sintering conditions by SPS.

## Introduction



## Results

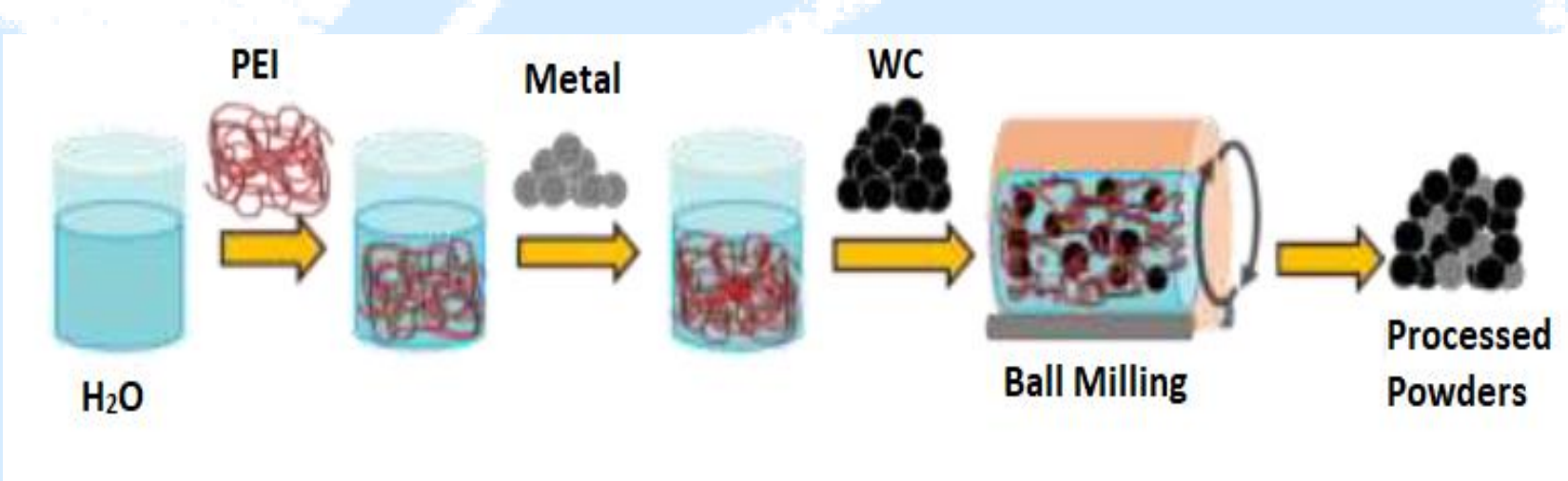
### WC/3wt%Ni



## Materials and Methods

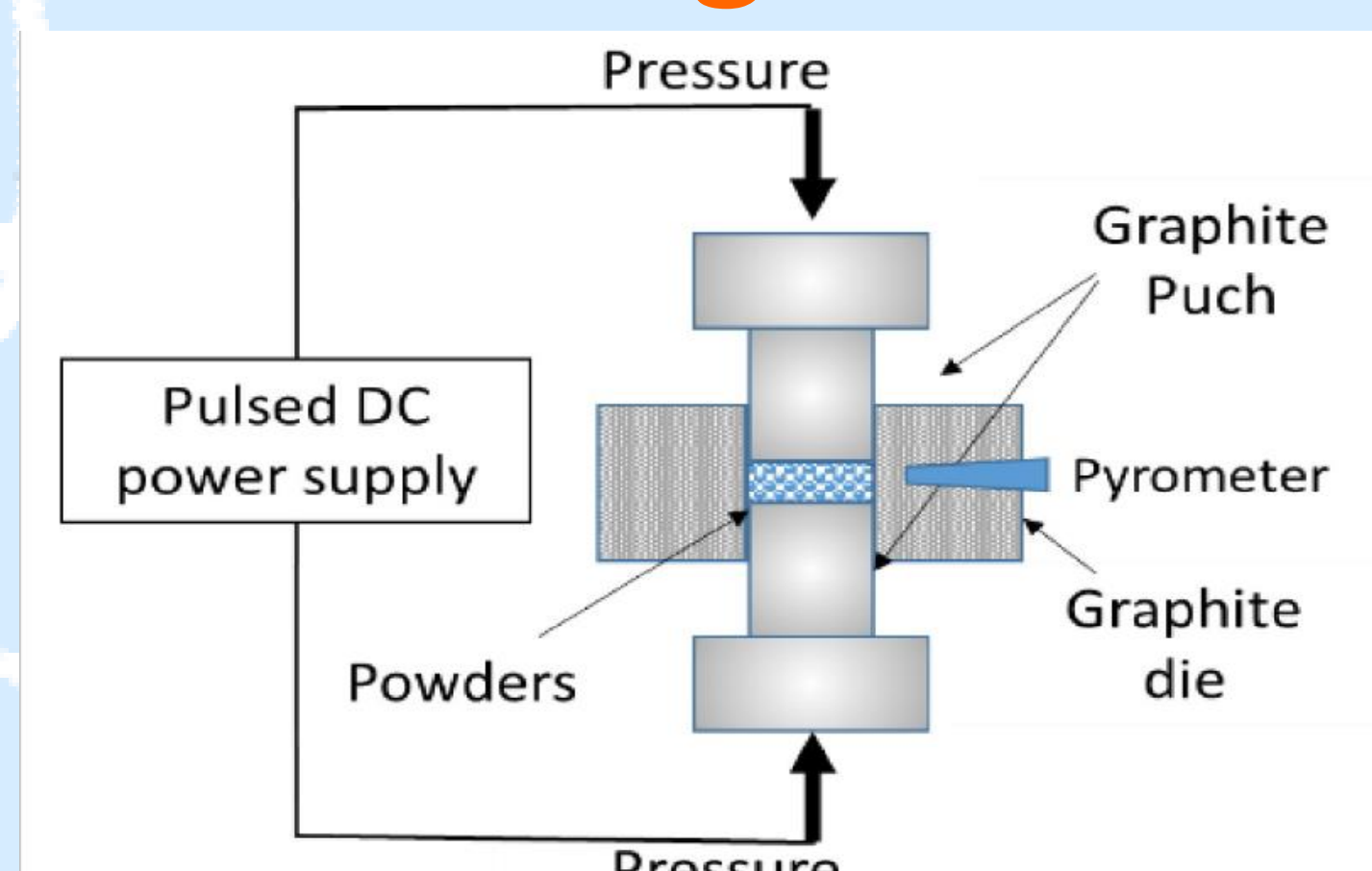
### Colloidal Process

1. Monolithic WC
2. WC/3, 6 wt% Ni



### Spark Plasma Sintering Process

T (°C) (WC/5VOL%Ni) = 1300  
 T (°C) (WC) = 1900  
 P (Mpa) = 60  
 Δt = 10min  
 ΔT° = 100°C/min

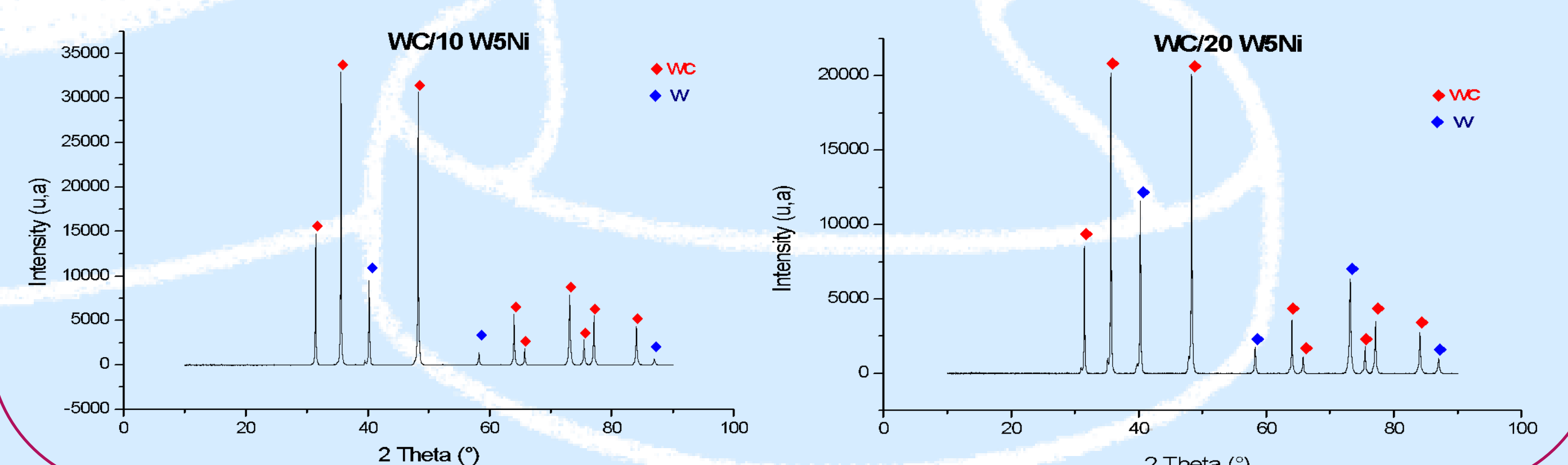


## Discussion and Conclusion

The presence of small amount of Nickel (3, 6 wt%) in WC by colloidal route drops the SPS temperature by 500 C°, opening new perspectives to fabrication of WC based cermets with less cost and good properties.

### Next complementary Work research

Coming research will enhance the SPS sintering conditions of WC/W composites using a synthesised powder (W-5vol% Ni) in 10 and 20 vol%. Dynamic SPS sintering studies will be validated with mechanicals properties of the WC/10(W5Ni) and WC/20(W5Ni) composites.



(1) E.M. Garcia-Ayala et al, Colloidal processing and sintering of WC-based ceramics with low Ni content as sintering aid, Journal of the European Ceramic Society (2020)

(2) E.M. Garcia-Ayala et al, Processing of WC/W composites for extreme environments by colloidal dispersion of powders and SPS sintering, International Journal of Refractory Metals & Hard Materials 84 (2019)

(3) In-jin shon et al, Sintering behavior and mechanical properties of WC-10Co, WC-10Ni and WC-10Fe hard materials produced by high-frequency induction heated sintering, Ceramics International 35 (2009) 339-344