

## Synthesis of WC-10wt.%Co Nanocrystalline Powders with Grain Growth Inhibitor by MTP

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### Abstract

To improve the fracture strength and wear resistance of WC-Co cemented carbide, various technologies to produce the nanocrystalline materials have been developed. Adding a grain growth inhibitor as one of these technologies has been studied activity for the purpose of retarding grain growth during liquid phase sintering. But there is a serious problem of micro-pore formation during sintering due to the addition of grain growth inhibitor by a simple mixing. In this study, WC-Co nanocrystalline powders with grain growth inhibitor in the site were prepared by MTP (Mechano-Thermic carburizing Process) to minimize the formation of micro pores and to retard grain growth effectively during sintering. And then the phase and grain size of WC-Co nanocrystalline powders were evaluated according to the condition of MTP.

## Coarsening Behavior of Nano-sized (Ti, W)C-Ni Composite Powder

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### Abstract

TiC- and Ti(CN)-based cermets were developed for high-speed cutting tools to replace WC-Co alloys. The application of such cermet systems was limited, however, due to low toughness values. WC addition to a TiC-Ni or Ti(CN)-Ni is known to be effective in improving toughness of the cermets. Therefore, in this study nano-sized (Ti,W)C-Ni powder of 30-40nm was synthesized by high energy milling and carbothermal reduction. This is to improve the toughness and hardness of the cermets utilizing fine solid-solution carbide particles. But it is found that the coarsening of nano-sized carbides is significant and inevitable during liquid sintering process at high temperatures. This study will show some of the results on the coarsening behavior of nano carbide particles during heating stage based on TEM observation and dilatometer.