Synthesis of TiC based composite powder by mechano-chemical method

Young-Woo Tak*, Seong-Hyeon Hong, Byoung-Kee Kim
Materials Technology Dept, Korea Institute of Machinery & Materials

1. Introduction

Titanium carbide has been widely used in the field of wear resistance tools and cutting tools. TiC powders are usually produced by the direct carbonization synthesis of metallic titanium and the carbothermal reduction of TiO_2 with various forms of carbon at high temperatures. However, the traditional carbothermal reduction reaction results in the formation of 1~2㎛ TiC powders. In order to produce an ultrafine TiC powder, the development of new method is required. Therefore, In this study, the mechano-chemical method has been used for synthesis of ultrafine TiC/Co composite powder.

2. Experimental

The precursor solution for spray drying was prepared by mixing of $TiO(OH)_2$ slurry and Co nitrate in distilled water. The solution was dried to form a precursor powders by spray drying. The conditions of spray drying were set as follows : temperature of inlet air 250℃, outlet air 130℃, atomizer rotation speed 15000 rpm. Powders obtained from spray drying were directly calcined in air temperature 500℃ for 2hours. This oxide composite powder and nano-sized carbon powder were ball milled, reduced and carburized by heat-treatment at 1250℃ in flowing H_2 atmosphere.

3. Results and discussion

Composite oxide powders were consisted of small spherical grains with a narrow size range and salt components were completely eliminated during the calcination process. Weight of composite powder mixed with carbon decreased by heating up to 1250℃. Ultrafine TiC particle was formed at low temperature such as 1250℃ due to the refinement of composite powder size and the decrease of carburization temperature by containing Co.

4. Conclusions

Synthesis of ultrafine TiC-Co composite powder by spray drying and reduction/ carburization was possible.

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