

Formation of dense, net-shaped ZrC-W composites by DCP technique at low temperatures

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In the present paper, synthesis of dense near net-shape transition metal-metal carbide by reaction casting is studied. This composite can withstand temperatures of 2000°C. Since the porosities of ceramic preform are filled with reaction products, this technology is also referred to as Dispersive Compensation Porosity (DCP). The effects of sintering and infiltration parameters on composition of ZrC/W composites produced by DCP were studied. For this means, porous WC preforms were first uniaxially pressed and then sintered at 1400°C for 2h. Preforms containing various porosity contents (54 to 57%) were resulted. The sintered preforms were exposed to molten ZrCu alloy at 1200°C for 1, 2 and 3h. The resulting specimens were then analyzed via X-ray diffraction. Scanning electron microscopy (SEM) was used to study the microstructure and diffusion of molten phase into porous preforms. Also the effect of infiltration duration was studied by microscopic images. The results indicate that increasing infiltration time to beyond 1 hour does not have significantly effect on the resulting phases. In addition the microstructures show grains of WC surrounded by infiltrated additives as a function of time. Finally feasibility of DCP method was proved for synthesis of high temperature metal-matrix composite where net-shaped structure is necessary.

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