

Fabrication of Graded Porous Structure with Pore Size Distribution by SPS Process

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Abstract

Ceramic filters used for dust and exhaust gas filtration at high temperature have good thermal properties such as high temperature oxidation and corrosion resistance. However, ceramic materials are inherently brittle and its usage is limited to the field where thermal or mechanical shock is not accompanied. In this sense attempts have been made to substitute the ceramic filters with the porous metallic filters for high temperature filtration under severe mechanical condition. Stainless steel is an appropriate material for high temperature service around 400-500 °C under corrosive environment. Combination of high permeability and good filtration required for filter is known to be achieved by porous structure with graded pore size or porosity gradient. The graded porous structure can be easily prepared by means of spark plasma sintering (SPS) process. The present work was undertaken to fabricate the stainless steel porous material with graded pore structure for high temperature application by use of SPS process. Optimal condition for the preparation of porous tube with radial pore size distribution and porous cylinder with longitudinally graded pore structure is explored. Correlation between filter property and graded pore structure is also examined in terms of quantitative and qualitative analysis of pore structure.