Effect on pore size distribution on filtration performance of ceramic filter media

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Either ceramic or metallic filter is generally used in order to remove a particle-laden flue gas with high temperature. However, ceramic filter is more relevant to be applied to extremely high temperature region. So far, it has been tested in both lab-scale and pilot scale experiments. Especially, a SiC ceramic filter has a high oxidation resistance, thermal expansion coefficient, corrosion resistance, thermal conductivity and excellent mechanical properties (Li *et al.*, 2011).

The selection of manufacturing components(ceramic materials, binders and sintering promoting agents) as well as their mixing ratio are very important in manufacturing ceramic filter media. Furthermore, pore size distribution of produced filter media is critical to determine the collection performance. Flue gas from combustion facilities will pass easily through the filter media when its porosity and pore size are large, resulting in low pressure drop and low collection efficiency (Ohzawa et al., 1998, De Freitas et al., 2006).

The purpose of this work is to investigate how the porosity and pore size distribution affect the filter performance of a ceramic filter. We prepared circular type ceramic filters with 47mm in diameter and 2.54mm in thickness which have different SiC powder distributions(SiC powder size : 25 ㎛, 100 ㎛, 200 ㎛).

The physical properties of produced filter media were shown in Table 1.

Table 1. Physical properties of produced ceramic filters.

SiC powder size [㎛]	Porosity [%]	Pressure drop [mmH_2O]
25	43.31	100
100	45.59	8
200	46.35	4

Pressure drop was measured at the face velocity of 1m/min. It was found that the pressure drop was decreased with increasing SiC powder size and porosity. The collection efficiencies of ceramic filters were plotted as a function of particle diameter in Figure 1. As powder size used in manufacturing filter media increased, the collection efficiency was decreased. We could obtain ceramic filter media with high collection efficiency by introducing SiC powders with 25 ㎛ in diameter.

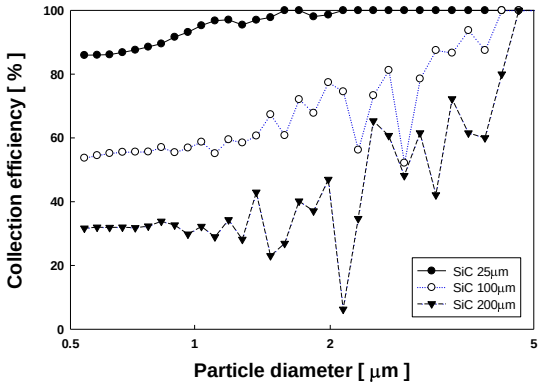

Figure 1. Dust collection efficiency as a function of particle diameter (face velocity=1 m/min).

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Li, J., Lin, H., Li, J. (2011) *J. European Ceram. Soc.* 31, 825-831

Ohzawa, Y., Nomura, K., Sugiyama, K. (1998) *Mater. Sci. Eng*. A255, 33-38.

De Freitas, N., Goncalves, j., Innocentini, M. and Coury, J. (2006) *J. Hazard. Mater.* B136 747-756