Supporting Information

Flexural strength evaluations and fractography analyses of slip cast mesoporous submicron alumina

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Archimedes principle for porous samples

The density of porous sample (ρ_{ps}) is given by Equation S1.

$$\rho_{ps} = \frac{dw}{V_{ps}} \qquad \text{Equation S1}$$

where dw is the dry weight of the porous sample and V_{ps} is the volume of porous sample including the open and closed porosity.

The wet weight (ww) is the saturated weight of the sample after impregnation with the suspending liquid into the open pore network. The surface excess liquid should be removed before measuring the wet weight and is mathematically described by Equation S2.

$$ww = dw + \rho_l V_{OP} \qquad \text{Equation S2}$$

where ρ_l and V_{OP} are the density of the liquid and volume of open porosity.

The immersed weight (iw) of the porous sample in the liquid is mathematically given by Equation S3.

$$iw = dw + \rho_l V_{OP} - \rho_l V_s \qquad \text{Equation S3}$$

From Equation S1, the V_{OP} can be deduced as:

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$$V_{OP} = \frac{ww - dw}{\rho_l}$$ Equation S4

From Equations S2 and S4,

$$V_s = \frac{ww - iw}{\rho_l}$$ Equation S4

Therefore, relative density can de deduced as:

$$\rho_{ps} = \frac{dw \times \rho_l}{ww - iw}$$ Equation S5

$$Relative\ density\ (\%) = \frac{dw \times \rho_l}{(ww - iw) \times full\ solid\ density} \times 100$$ Equation S6

From Equation S2, open porosity fraction (%) can be mathematically formulated as:

$$Open\ porosity\ (\%) = \frac{ww - dw}{\rho_l \times V_s} \times 100$$ Equation S7

$$Open\ porosity\ (\%) = \frac{ww - dw}{ww - iw} \times 100$$ Equation S8