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Ceramic Materials

- 15-21** The specific gravity of Al_2O_3 is 3.96 g/cm^3 . A ceramic part is produced by sintering alumina powder. It weighs 80 g when dry, 92 g after it has soaked in water, and 58 g when suspended in water. Calculate the apparent porosity, the true porosity, and the closed pores.

Solution: From the problem statement, $\rho = 3.96$, $W_d = 80 \text{ g}$, $W_w = 92$, and $W_s = 58$. From the equations,

$$\text{apparent porosity} = \frac{W_w - W_d}{W_w - W_s} \times 100 = \frac{92 - 80}{92 - 58} \times 100 = 35.29\%$$

The bulk density is $B = W_d / (W_w - W_s) = 80 / (92 - 58) = 2.3529 \text{ g/cm}^3$.
Therefore:

$$\text{true porosity} = \frac{\rho - B}{\rho} \times 100 = \frac{3.96 - 2.3529}{3.96} \times 100 = 40.58\%$$

$$\text{closed porosity} = 40.58 - 35.29 = 5.29\%$$