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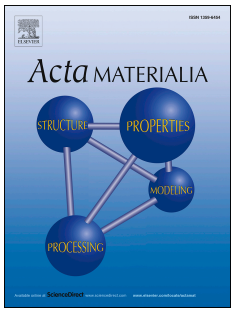

Prediction of ceramic fracture with normal distribution pertinent to grain size

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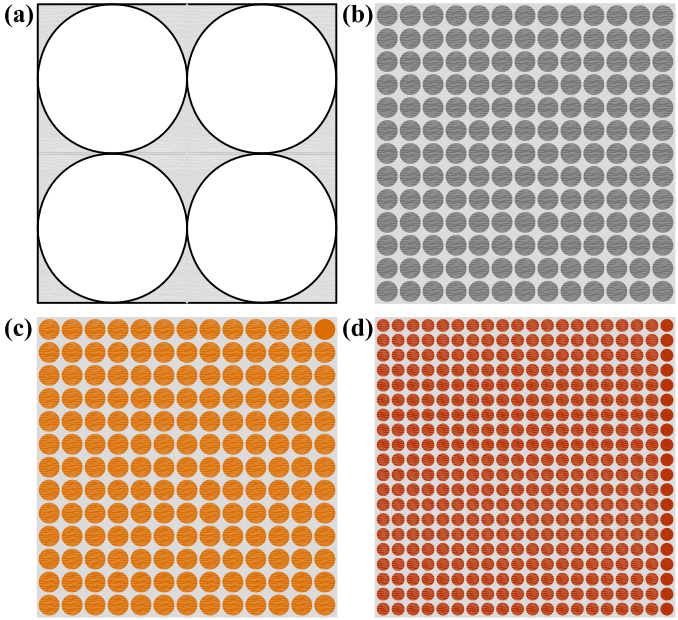

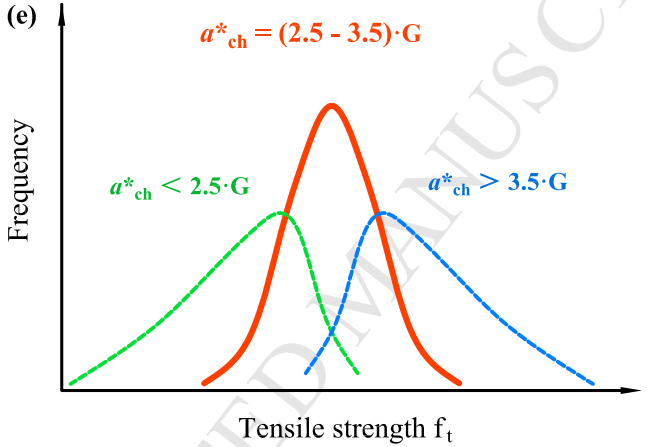

(a) Al_2O_3 **G = 20 μm**, a = 0.8 - 650 μm
(b) SiC **G = 3 μm**, a = 100 *nm* - 250 μm
(c) Si_3N_4 **G = 3 μm**, a = 100 *nm* - 250 μm
(d) Sialon **G = 3 μm**, a = 100 *nm* - 160 μm

$$\sigma_N = \begin{cases} \dfrac{f_t + 2\sigma}{\sqrt{1+\dfrac{a}{3.0\cdot G}}} & \text{upper limit for 96\% reliability} \\ \dfrac{f_t}{\sqrt{1+\dfrac{a}{3.0\cdot G}}} & \text{mean value curve} \\ \dfrac{f_t - 2\sigma}{\sqrt{1+\dfrac{a}{3.0\cdot G}}} & \text{lower limit for 96\% reliability} \end{cases}$$

$a^*_{ch}/G = 3.0$ (G: grain size)

$a^*_{ch} = 0.25\cdot(K_{IC}/f_t)^2$

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