

Lecture

Powder Processing

Powder Compaction:

- packing of powder particles:
- packing fraction, # of powder contacts
 - integral for sintering.

- ↗ Unisize spheres:
 - ↳ during regular packing: \rightarrow packing fraction \rightarrow coordination no.

- Regular structure:

- i) simple cubic $\rightarrow \rho_F = 52\%$
 $\rightarrow N = 6$

- ii) BCC $\rightarrow \rho_F = 0.68 ; N = 8$

- iii) FCC $\rightarrow \rho_F = 0.74 ; N = 12$

- No. of particles per unit bulk volume

$$N_p = \frac{\rho F}{\pi D^3}$$

→ $N_c = \frac{cN}{2}$ → no. of particle contacts per unit volume.

$$N_c = \frac{3(\rho F)(cN)}{\pi D^3}$$

→ $\rho F \approx 0.6$ { for loose random packing }

$\rho F \approx 0.64$ { for dense random packing }
non-regular arrangements.

↳ above values for unisize spheres and cN range

→ Powder particles of Alumina $\{Al_2O_3\}$

↳ Loose random packing $\Rightarrow \underline{\rho F = 0.3}$

↳ packing fraction reduces due to agglomeration of nano size powder spheres.

$$N = \frac{\pi}{(1-p_f)} \quad N_p = \frac{6 p_f}{\pi D^3} \quad N_c = \frac{3(p_f)}{(1-p_f)D^3}$$