FUNDAMENTALS OF POWDER MANUFACTURING

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CERAMIC POWDER SYNTHESIS

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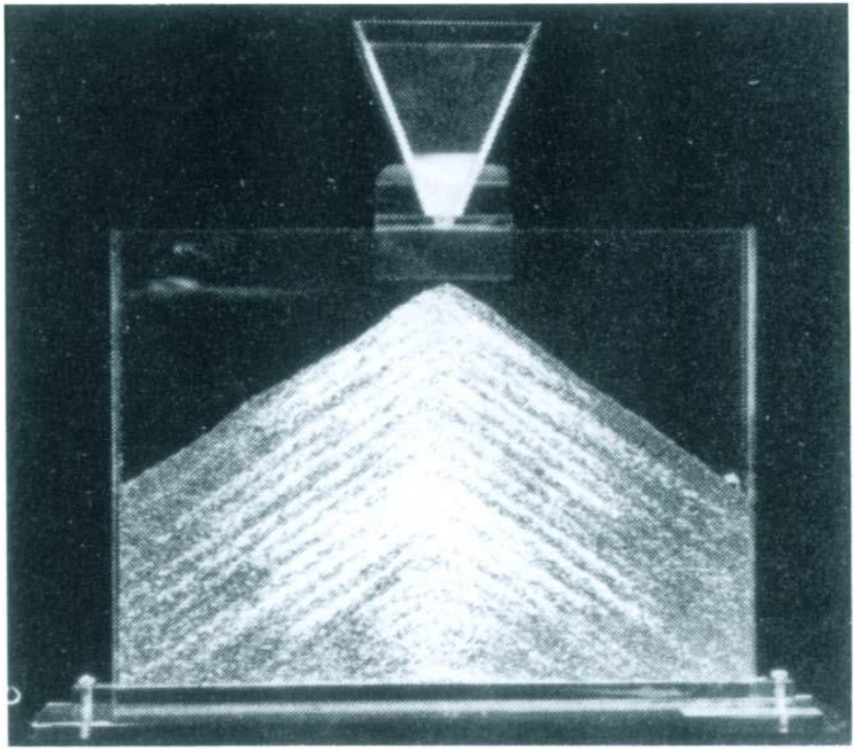
1- POWDER SAMPLING

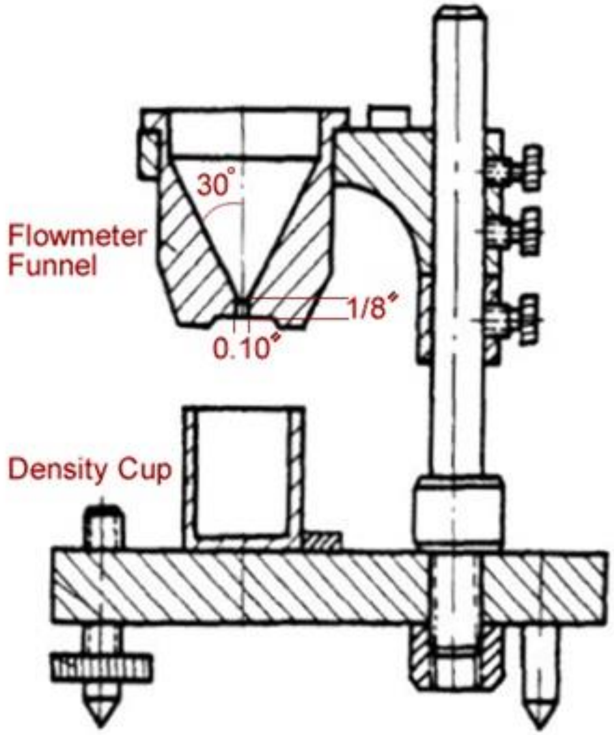
GOLDEN RULES OF SAMPLING



CROSS-SECTION OF A PILE OF BINARY POWDER SHOWING DEMIXING OF LARGER BLACK PARTICLES (≈1 RAM) TO THE PERIPHERY AND FINER WHITE PARTICLES (≈0.2 RAM) TO THE CENTER OF THE PILE.

FLOWABILITY

3-APPARENT DENSITY



30°
Flowmeter
Funnel
1/8"
0.10"
Density Cup

4-TAP DENSITY


AUTOTAP
Quantachrome

$$\frac{d(\rho - \rho_0)}{d \ln N} = -(\rho - \rho_0)k$$

5-COMPRESSIBILITY

$$Compressibility\ Index = 100 \times \left(\frac{V_o - V_f}{V_o} \right)$$

$$Hausner\ Ratio = \frac{V_o}{V_f}$$

V0	=	unsettled apparent volume,
Vf	=	final tapped volume

Ceramic green bodies are typically characterized in detail after drying because it is not necessary to take extraordinary precautions to assure that the green body lose no further weight.

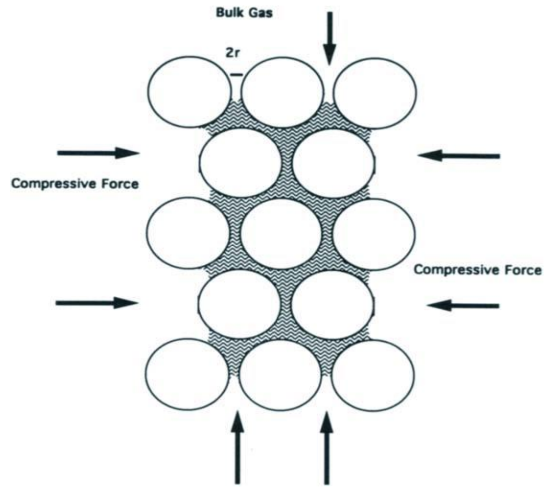
6- STRENGTH OF A GREEN BODY

fraction of theoretical density, which is also the solids volume fraction .The average density is certainly an important property, however, the uniformity of the density and uniformity of the microstructure in the green body are among the most important properties because anisotropic green bodies warp and crack during drying, binder burnout, and especially sintering.

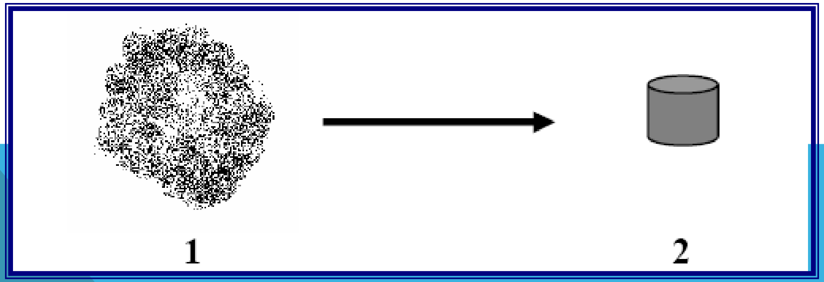
$$\sigma_c = -\frac{2\varepsilon\gamma_{LA}\cos\theta}{r_{pore}}$$

where

: P l load shed, D diameter and t thickness.



COMPRESSIVE STRESS CAUSED BY THE CAPILLARY ACTION OF LIQUID FILLING THE PORES OF A CERAMIC GREEN BODY.

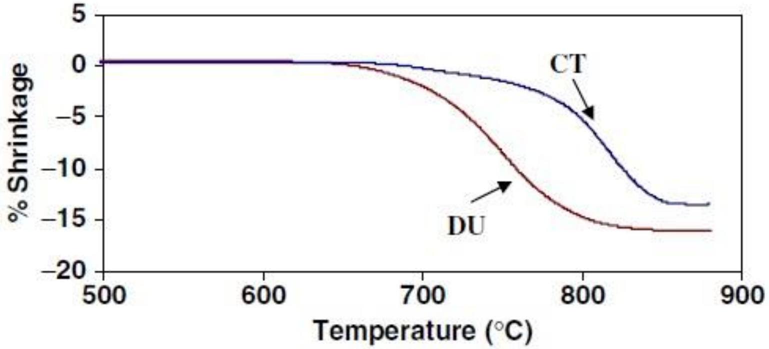


FREE CONVERT THE POWDER TO SQUEEZED THROUGH

7- SHRINKING

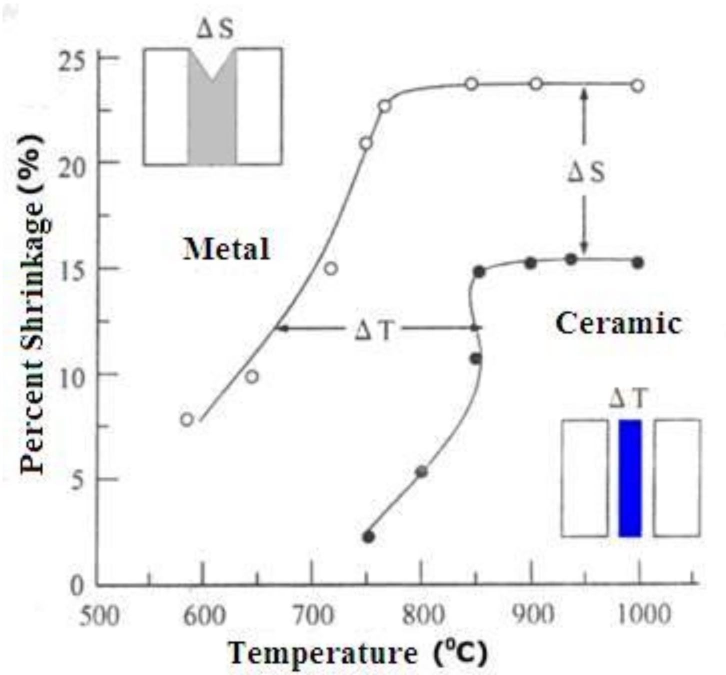
whether the reaction is endothermic or exothermic. As with the shrinking core model, boundary layer mass and heat transfer fluxes are applicable as well as the surface reaction flux.

When this model is applicable, the particle morphology changes drastically during reaction from particles to flakes of particles.



ceramic. figure shows the firing shrinkage behavior of ceramic material and conductive materials in the function of temperature:

conductor/ceramic is ΔT. In order to have easier joint, it is necessary to optimize the size of conductive granules, its content and the aggregates.



CONDUCTIVE MATERIALS IN THE FUNCTION OF TEMPERATURE