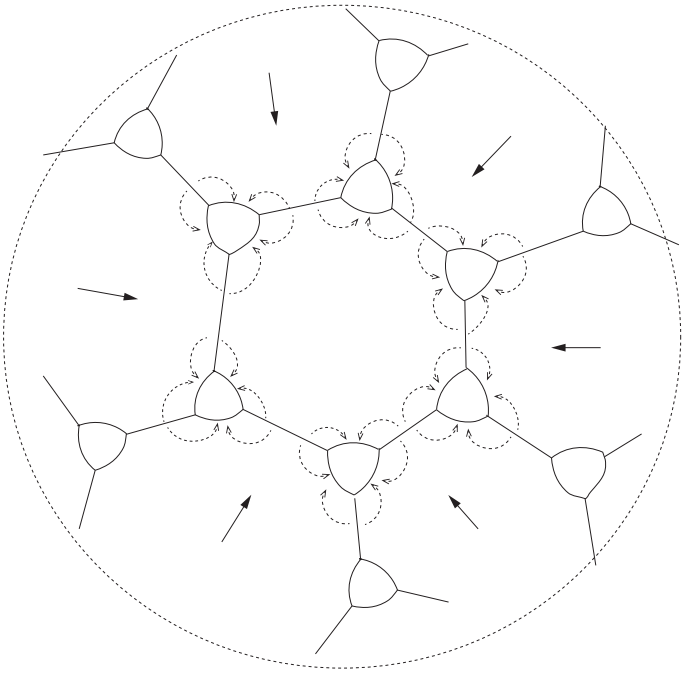
08/31/21

0701B Pores - The Driving Force for Sintering

1.

The schematic below shows the transport of mass from the boundaries into the adjacent pore to produce sintering.



Make a sketch of the microstructure after all the pores in this picture of sintered and the material is fully dense.

2.

Consider a lenticular pore (shaped like a lens) placed within a flat grain boundary. The two surface of the pore have a radius of curvature equal to r, and the meet at the grain boundary with a contact angle θ.

Note that the lens projects as a circle in the plane of the boundary.

Show that the volume of the pore scales as the third power of r by a relationship of the type,

$$V_{pore} = r^3 F(\theta)$$

Obtain the expression for $F(\theta)$.

3.

Make a plot of $\frac{r^3}{V_{pore}}$ vs. θ.

What is the value of θ when $r \to \infty$

4.

What is the significance of the above limit with respect to the driving force for sintering?