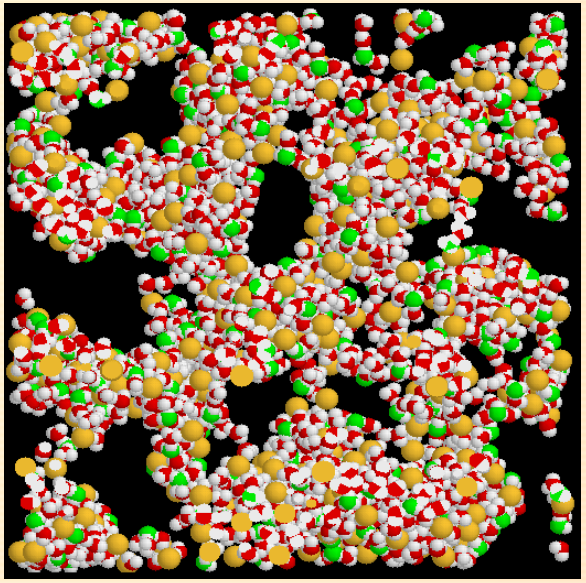
Water Mobility in Bulk Systems – Effect of Connectivity

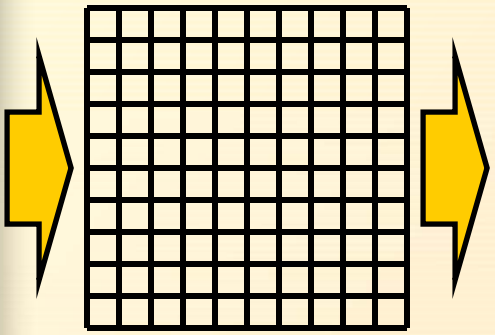
Invoke Percolation Theory to account for connectivity of aqueous domain within PEM and obtain effective diffusivity.

$$\int_0^{\infty} \frac{D_{eff} - D}{\left(\frac{z}{2} - 1\right) D_{eff} + D} g(D) dD = 0$$

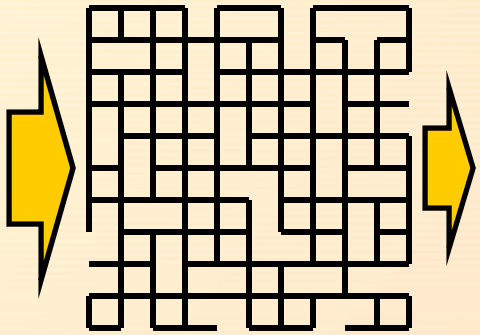
$$g(D) = p_{EMA}\delta(D - D_b) + (1 - p_{EMA})\delta(D - D_o)$$



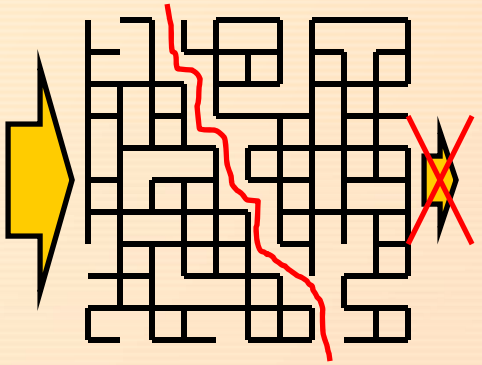
Percolation theory relates the effective diffusivity to the fraction of bonds that are blocked to diffusion.



no blocked bonds
$D = D_{open}$



some blocked bonds
$0 < D < D_{open}$



beyond threshold
$D = 0$