CAPILLARY FILLING OF MICROCRACKS BY LIQUID SILICATES IN ROCKS

Summ B.D., Lebedev E.B.
(Lomonosov Moscow State University, Moscow, Russia);
(Vernadsky Institute of Geochemistry and Analytical Chemistry RAS, Moscow, Russia)
elkor@gekhi.msk.su; fax: (095)9382054; phone: (095) 939-70-05

Capillary rise H of wetting liquid in cylindrical tube is determined by Jurin equation:

$$H=\frac{2\sigma\cos\theta}{\Delta\rho\cdot r\cdot g}$$

σ is a liquid's surface tension, $\Delta\rho = (\rho_1 - \rho_2)$ is a difference of densities of liquid (1) and of a forces out phases (2), g is a gravity acceleration, θ is a contact angles (in many systems $\cos\theta \approx 0.9\text{-}1.0$). For planar clearance with width 2α capillary rise H is halt the rise in a tube with diameter d=2r. In horizontal cylindrical capillary the meniscus movement depends on time t parabolically. In conical narrowing canals the filling process is much more complicated. It is necessary to take into account the counter pressure of gases in the narrowing part of capillary canal. The counter pressure in the dead ends can stop the capillary flow. So the capillars (microcracks) would be filled only partially. For numerical calculations it is necessary to take into account that the cross section of canal is not constant. In these canals liquids flow slower than in cylindrical tubes. For colloidal solutions and suspensions the effective viscosity η^* will dominate. The Einstein equation takes into account this effect: $\eta^*=\eta(1+\alpha\varphi)$, φ is a relative fraction of colloidal particles ($\varphi<<1$), α is a coefficient which depends on particle's form (for spherical particles $\alpha=2.5$; for all others $\alpha>2.5$).

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