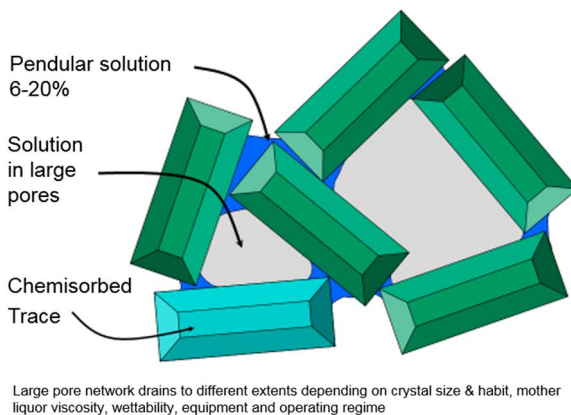


it also increases as the quantity of material dissolved in the solution increases. It is therefore important to evaluate the trade-off between isolating the product at a low temperature where solubility is usually lowest but viscosity may increase or alternatively sacrificing some yield and filtering at a higher temperature to achieve a faster filtration. A very rough rule of thumb is that solvent viscosity increases by between 10% and 20% for every 10 °C of cooling between 20 °C and 0 °C. This contrasts with “Black’s rule”,<sup>1</sup> typically, the solubility of organic compounds doubles every 20 °C the temperature increases, this would suggest it is advantage to maximise yield by isolating at the lowest practical temperature consistent with maintaining product purity.

Darcy’s equation describes the flow of a fluid through a filter medium and through a filter cake as it forms. Reflecting on the equation indicates appropriate paths to take when selecting filters or designing filtration processes.

### 13.4 Washing

At the precise moment when the filter cake surface becomes exposed the cake is said to be saturated; that is all of the voids between the crystals are completely filled with the mother liquor from which the product was crystallized. If such a cake is then drained (usually termed deliquored) the solution in the large pores is removed. The mother liquor which is retained at the points of contact between particles is termed pendular solution. Depending on the contact angle of the mother liquor on specific crystal faces many of the crystal faces may also retain a thin film of mother liquor. This situation is illustrated schematically in Figure 13.3. The relative volume of mother liquor which drains from large pores to that retained in the deliquored cake varies significantly with crystal habit and crystal size distribution and with solvent properties, especially viscosity.



**Figure 13.3** Schematic illustration of mother liquor hold up in a saturated filter cake.