In this equation, C is the instantaneous concentration, C_S is the saturation concentration, S is the surface area, V is the volume of solution and n is the reaction order. If the equilibrium solubility is low, the surface area can be treated as a constant. In contrast, Case 2 (Fig. 7.2) describes the dissolution of a more soluble material of limited mass. Dissolution takes place rapidly and continues until the material is entirely dissolved. In Case 2, the surface area does not remain constant so the rate equation (7.1) must be modified to take account of the (generally unknown) time dependence of the surface area, S(t). When the soluble material is completely dissolved, of course, the accumulated concentration in solution becomes constant and the rate drops to zero. With respect to minerals that might be expected in spoil materials, calcite would behave as Case 1; gypsum as Case 2.

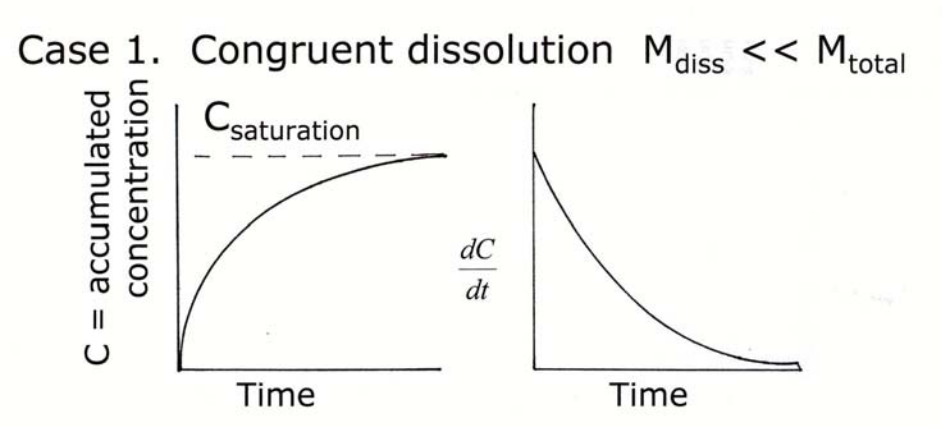

Figure 7.1. Schematic dissolution curve for a congruently dissolving solid of low equilibrium solubility.

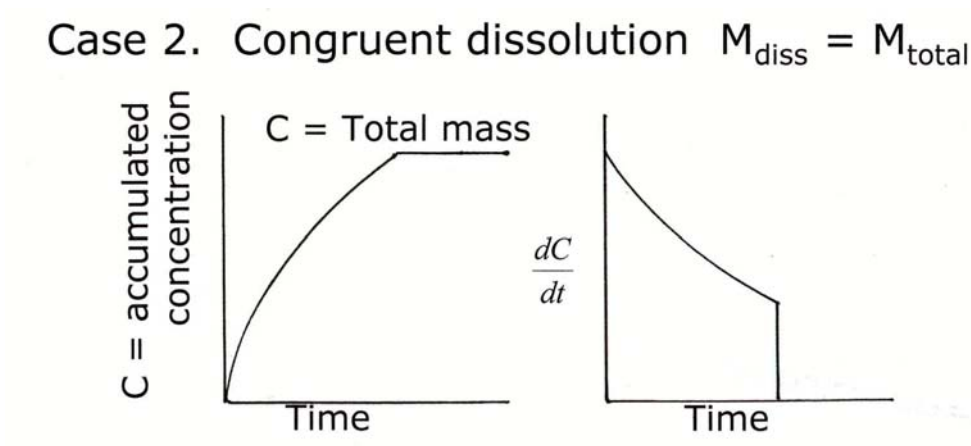

Figure 7.2. Schematic dissolution curve for a congruently dissolving solid of high solubility and limited mass.

Most minerals, however, do not dissolve by simple congruent dissociation into component ions but instead dissolve by chemical reaction with water or hydrogen ions as illustrated in