composition gradients controlled the decomposition of the reactants, or, that growth took place most readily in regions where the reactant minerals were intrinsically more soluble.

The model favored here is that local imperfections or impurities on the calcite surface acted as nucleation centers.[2] Growth was most rapid at the calcite–wollastonite interface. Solution of calcite was accelerated by the local composition gradients set up near growing wollastonite crystals. After the calcite was sheathed in wollastonite growth continued, but the transport of silica to the highly reactive calcite surface was slowed. Growth rate then became dependent either on the transport of Ca through the wollastonite to the wollastonite–fluid interface, and/or the transport of silica to the calcite–wollastonite interface.

Alternatively, it could be argued that, at the beginning of a run, the fluid phase becomes rapidly supersaturated with respect to wollastonite. This supersaturation is restricted to the calcite surface because of the differing rates of solution of calcite and quartz. When the fluid and calcite are separated by the wollastonite layer, the fluid reaches equilibrium with wollastonite and the reaction stops.

Conclusions

The interpretations offered suggest that specific surface area of calcite is of critical importance to the rate of reaction. Experimentalists have long known that reducing the grain size of reactants increases the rate of reaction. This is normally attributed to increase in the rate of solution. This study shows that the accelerating effects may be due equally to increase in number of nucleation and growth sites.

It is further suggested that some reactions may be self-arresting due to effects analagous to the mantling phenomena in these experiments.

[2]*Note added in proof:* A recent study by Kridelbaugh (1971) shows that, in the presence of *pure* CO_2, wallastonite nucleates and grows on quartz. This is in marked contrast with the results of this study and indicates that the composition of the fluid phase plays a major role in determining the nature of the reaction mechanism.

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