Recent Development in the Kinetic and Thermdynamic Analysis of Isothermal Microcalorimetric Data: Solid State and Complex Reaction Systems

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Microcalorimetry is known to be capable of investigating complex heterogeneous sytems. However a challenge still remains in interpreting data derived from solid state reactions – *i.e.* from **direct** observation of these processes without the use of ancillary data. This presentation will describe a new approach to this problem area. It will also outline an approach to a different, but similarly complex, situation – that of the study [1] of the antimicrobial bioactivity of Silver bearing wound dressings.

Previous work from this laboratory [2] has shown that it is possible to determine kinetic and thermodynamic parameters (including values for the equilibrium constant, K, and for ΔG, ΔH and for ΔS) from isothermal heat conduction microcalorimetry. The equations that allow this were developed for single reaction processes although there has been an extension [3] to complex sequential reactions that are well separated in terms of rate constants and enthalpies. Solid state reactions have proved a little more difficult to resolve largely because the exponents present in the equations are not order parameters but they are fitting parameters which describe the reaction mechanism [4]. Procedures have now been developed which provide solutions to this issue and hence make solid state reactions more tractable. These methods will be presented and discussed.

A more problematic area is that of complex simultaneous reaction systems (both solution and solid state). Significant progress has been made in dealing with such reactions and so theoretical approaches will be described and illustrated through the use of simulated data.

Ag bearing wound dressings have been studied on interaction with *S.aureus* and with *P.aeruginosa*. Comparison is made with the equivalent amount of $AgNO_3$ that would be required to elicit the same bioactivity as does the dressing.

References

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