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Short communication

Note on the use of the term “crystolysis”

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Recently, Galwey and Vyazovkin have been engaged in a debate over the significance, for the kinetics of a solid state reaction, of apparent activation energy that varies continuously with α, the degree of reactant conversion [1–3]. Such discussions will, in our belief, contribute greatly to a healthy development of solid-state kinetic analysis away from the emphasis on empirical or numerical data fitting.

This development will surely take years. Here, we wish to raise a minor point that may, however, be non-trivial, namely the word “crystolysis” that made to the title of Galwey’s paper [2], from its origin as one possibility for the index reference for the decomposition of solids [4].

We suggest that such terminology is inappropriate, based on two reasons.

Our first object is philological. The expressions *pyrolysis* or *thermolysis*, *photolysis*, *radiolysis* and *hydrolysis* have always denoted decompositions *by* heat, light, ionizing radiation and water, respectively. Perhaps we may also talk of *electrolysis* of a solid electrolyte *by* current and “*dielectrolysis*” of an insulator *by* electric field. Such nice convention would be broken if then “crystolysis” referred to a decomposition in which the reactant or one or more of the reactants belong to crystalline phases. Well, *frontolysis* does indeed stand for the dissolution *of* a weather front, but that is in the less precise science of meteorology!

The other objection is scientific, and therefore more fundamental. Although a reactant starts as a single crystal or as a polycrystalline sample, its decomposition may not, on the atomic level, proceed in an ordered lattice. At active sites on a free surface, or on an interface between the reactant and an reaction product, the atoms may suffer so severe a disorder that the theoretical description of their rearrangement becomes easier if they are treated as amorphous. A crystal may not decompose as a crystal! The peculiarities in the kinetics of such reactions, $f(\alpha)$, may derive simply from the geometrical constraints on the surface or interface, an example being the melting of ice, as Galwey et al. have themselves shown [5]. Prior to a conclusive study on a particular solid-state decomposition we cannot tell how “crystalline” is its decomposition mechanism, so we should not apply to it any a priori label “crystolysis”.

We note that, besides Galwey in several of his publications, L’vov has also employed the title term [6]. On the other hand, the same term has also invoked for “an early sign of hypoxia in the mitochondria” [of a cell] by biologists, in a paper [7] entitled “Diagnosis of myocardial ischaemia by epicardial detection of potassium ion activity,” or whatever that means. Fortunately, a fight over the right to definite this term seems unnecessary.

In summary, “crystolysis” is inappropriate because all the other “-olysis” characterize atomic rearrangement phenomena occurring under various influences,

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but have nothing in common regarding the form of the reactant(s). More importantly, to substitute it for the decomposition of solid would be scientifically over-restrictive and therefore misleading in some cases.

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