*Thermochimica Acta*, 135 (1988) 3–4
Elsevier Science Publishers B.V., Amsterdam 

# SYNTHESIS AND REAL STRUCTURE OF INORGANIC MATERIALS

HANS-RUDOLF OSWALD
Institute for Inorganic Chemistry, University of Zürich, Winterthurestrasse 190, CH-8057 Zürich, Switzerland.

## ABSTRACT

The development of new as well as the reproducible preparation of known inorganic compounds with specific chemical and physical properties are of increasing importance. This fact reflects mainly demands evoked by the actual significance of materials science and technology (see e.g. [1]). In this framework, inorganic solid state chemistry comprising the topics "Reactivity of Solids and Heterogeneous Solid State Reacations" gets most relevant. As a consequence processes of the type

$$\Sigma \text{ Solids I} + \Sigma \text{ Gases I} \rightleftarrows \Sigma \text{ Solids II} + \Sigma \text{ Gases II}$$

or

$$\Sigma \text{ Solids I} + \Sigma \text{ Liquids I} \rightleftarrows \Sigma \text{ Solids II} + \Sigma \text{ Liquids II}$$

have to be studied with respect to an optimization of the experimental conditions under which the desired products are obtained [2,3]. Thus, not only the selection of appropriate parent solids, but also the knowledge of the role of the volatile agents are indispensable prerequisites [4]. The elucidation of structural reaction mechanisms including detailed studies on topochemistry and topotaxy [5,6] enables an appropriate control of the product formation. As a matter of fact, there are solids which can only be isolated by a topotactic route. In addition, the actual reactive or inert gas atmosphere and pressure further allow to influence decisively the course of reaction.

Within this concept influences on the real structure of the so-formed mono- or multiphasic materials, comprising morphology, size of particles, domain structures, etc. have to be integrated.

Quantitiative thermal analysis combined with independent complementary techniques such as X-ray diffraction, light and electron microscopy,

Landseas Plenary Lecture.
The full paper will be published in *Pure and Applied Chemistry*.

*Thermal Analysis Proc. 9th ICTA Congress, Jerusalem, Israel, 21–25 Aug. 1988*
0040-6031/88/$03.50 

simultaneous mass spectrometry or gas chromatography, etc. represent well-suited tools for such studies [7]. Moreover, energetic and kineteic data can be derived and thus, insights into the fundamental problem of establishing correlations between macroscopic and microscopic reaction mechanism are achieved.

As illustrative examples the conrtolled generation of microcrystalline materials from suitable precursor phases such as mixed metal crbonates, oxides or coordination compounds are described. The obtained products - catalytically relevant dispersed metals or alloys on supports, mono- or biphasic transition metal sulfides, etc. - represent members of a framework which constitutes the basis for the generation of 'tailor-made' inorganic materials.

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