PLASTIC CRYSTALS AND THEIR POTENTIAL USE IN NEW TECHNOLOGIES

Some necessary comments


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The paper gives some comments about the potential use of plastic crystals in energy
storage. The main point deals with the possibilities of binary solid solution formation. Three
binary phase diagrams in the pentaerythritol series are commented on.

Introduction

A review article entitled 'Les cristaux plastiques en vue d'applications
thermiques dans les technologies nouvelles' recently appeared in this jour-
nal [1]. This paper gives partial and even sometimes erroneous information
about plastic crystals. The complete absence of bibliographic references
must be emphasized.

The author chose the pentaerythritol series, i.e. pentaerythritol (PE),
pentaglycerin (PG), neopentylglycol (NPG) and their solid solutions to il-
lustrate the potential applications of plastic crystals.

One must express regret for not finding the actual state of the art in this
paper, whose title suggests a general scope. The included results are only
partial. A critical examination of the already abundant scientific literature
would be necessary because some discrepancies are currently observed [2–15]. Apart from this kind of oversight, numerous imprecise or wrong statements may lead to the reader to erroneous conclusions.

One point may concern the preparation of 'mixtures' using water recrystallization procedures. PG and NPG are hygroscopic materials, and it is even possible to form hydrates NPG·6H₂O [15], PG·4H₂O [8] and PG·xH₂O (x varying from 1 to 20) [17], which will not be easily and completely destroyed in the vacuum evaporation steps.

The main point concerns the possibilities of binary solid solution formation. No correct statement can be made if the phase diagrams are unknown (or not taken into account). For the chosen series this necessity is particularly important, due to the diversity of the phase diagrams for PG-PE [6], NPG-PG [10] and NPG-PE [8, 9, 11, 12]. It is the solid-solid transition (crystal-plastic crystal) of either pure components or solid solutions which is concerned in view of applications for energy storage. In the case of solid solutions, the storage is no longer isothermal, but takes place in a temperature range which goes from the inferior solvus to the superior one (crossing of the two solid phases domain).

![Fig. 1 PG-PE phase diagram (Ref. 6); a: tetragonal; C: face centered cubic; L: liquid](image)

PG-PE (Fig. 1) is the only binary system which shows complete miscibility in the two kinds of solid states, i.e. the only one which permits the

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