

Polymorphism of drug compounds : mineralogy meets pharmacy

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Polymorphism, i.e. the ability of a compound to form different crystal structures is frequently encountered among minerals. Since almost every important rock forming mineral undergoes at least one structural phase transition as a function of temperature and/or pressure, mineralogists are quite aware of this phenomenon and have gathered a considerable knowledge to deal with this solid state problem.

However, polymorphism is not a phenomenon that exclusively concerns natural or synthetic inorganic materials, but occurs in organic compounds as well. Apart from being an intellectual challenge related to basic research, the importance of identifying and characterizing different crystal forms of a drug has been well documented in the literature. Differences in solubility, dissolution rate, morphology, mechanical properties and physicochemical stability of different modifications demand a detailed study of polymorphism of any new drug molecule. This has been recognized by the public authorities in the mid 90th why such studies are nowadays an integral part in drug development. Moreover, patenting of new solid state forms became an important part of modern life-cycle management of innovative pharmaceutical compounds.

The solid state characterization of the different polymorphs of a drug substance requires many analytical tools that are well established in mineralogy, including polarized light and hot stage microscopy, thermal analysis (DTA-DSC-TG), spectroscopic techniques (IR, Raman, solid state NMR) or X-ray diffraction (single crystal, powder).

In this contribution we will present some results from an industrial funded project where groups from pharmacy and mineralogy work jointly in a research program and share their expertise for the benefit of a comprehensive understanding of the materials under investigation.

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