

Thermodynamic Studies of the Polymorphs of Sulfathiazole

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Polymorphism of solid drugs is one of the central problems of pharmaceutical sciences, both in the fundamental and in the applied aspects. Five polymorphs are known at the present time for sulphathiazole, $C_9H_9N_3O_2S_2$. The literature data on the temperatures and enthalpies of the polymorphic transitions of the polymorphs are contradictory. Different melting temperatures were reported for different polymorphs.

The aim of the present study was to get reliable and reproducible data on the polymorph transitions and melting of the sulfathiazole. Heat effects of the thermal transformations were measured using a differential scanning calorimetry; both the starting samples and the products after the transformations were characterized by single-crystal and powder X-ray diffraction.

Reliable calorimetric data could be obtained only when single crystals of the polymorphs were used. A powder sample could contain poorly controllable amount of admixtures of other polymorphs. In many cases, X-ray powder diffraction or vibrational spectroscopy did not allow to reveal the presence of another polymorph, either because of the small amount of the impurity, or because of the similarities in the structures of the polymorphs and in the corresponding diffraction and spectral patterns. A "contamination" of the sample by impurity polymorphs could take place not only during crystallization from solutions, but also on grinding the sample in a mortar when preparing it for the measurements. Besides, the calorimetric measurements themselves were more precise if carried out with single crystalline samples.

The results obtained on the thermal transformations of the polymorphs of sulfathiazole made us revise some of the existing views on the relations between the polymorphs.

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Key-words

sulfathiazole, polymorphs, heat capacity, polymorphic transformations, thermal analysis, calorimetry, X-ray diffraction