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Studies on the Melting Process of Acetylsalicylic Acid Single Crystals.

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Acetylsalicylic acid is one of the oldest and often studied substances with respect to phenomena such as polymorphism, correlation between habit of crystals and solubility in various solvents. Energetic non-equivalence of the different planes of single crystals of acetylsalicylic acid in the dissolution process has been proposed [1]. Moreover, in order to describe solubility experiments, parameters based on surface areas of the corresponding planes of single crystals have been introduced. In the presented study, kinetic aspects of crystallisation and dissolution have been extended to the melting process of acetylsalicylic acid single crystals. Particular attention has been paid to the relationship between the geometry of the crystals and the time consumption of two- and three-dimension growth of liquid phase nuclei respectively.

DSC measurements were carried out under isothermal conditions and the fraction reacted during time, a(t), was calculated from the curve of heat effect. The kinetic curves were described by means of the Avrami-Erofeev equation: $- \ln(1 - \alpha) = k \cdot t^n$ followed by analysis of the parameter *n.* Relative time consumption descriptors of two-dimension, $I('2') = \left| \frac{t('2')}{t('2') + t('3')} \cdot 100\% \right|$ and three-dimension $I('3') = \frac{t('3')}{t('2') + t('3')} \cdot 100\%$, nuclei growth (where t ('2') and t('3') are the absolute time consumption of two- and three-dimension nuclei growth, respectively) have been introduced. It has found that kinetic curves in general are very sensible to the total sizes of the single crystals. On the basis of correlation analysis the following dependencies for strictly definite crystal sizes (trajectory into the space of sizes of the crystals studied) were found: a) Two dimensional nuclei growth, I('2'), is a function of the total surface area of the crystal, *S,* and of the surface area of plane (ac), *Sac;* b) Three dimensional nuclei growth, I('3'), is a function of total surface area of the crystal divided by its mass, *S/M,* and of the surface area plane *(ac)* divided by its mass, *(Sac/M).*

The obtained experimental data are interpreted on basis of the "layers" structure of crystals of acetylsalicylic acid.

[1] A. Watanabe, Y. Yamaoka, and K. Takada, Chem. Pharm. Bull. 30 (8) (1982) 2958.