POLYMORPHISM OF EVEN FATTY ACIDS FROM N-HEXADECANOIC ($C_{16}H_{31}O_2H$) TO N-OCTADECANOIC ($C_{18}H_{35}O_2H$) ACIDS

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Fatty acids have attracted the attention of the scientific community owing to their striking fundamental properties which are interesting for science and technology. They are significantly important in foods, pharmaceuticals and cosmetics technology. They also play fundamental roles in human nutrition because they are the main source of energy for the body. The functional activity of biological membranes depends both on the amount and the type of fatty acids present in the phospholipids, and most of them contain one saturated and one cis-unsaturated fatty acid at the first and second positions of the glycerol skeleton. The polymorphism of normal saturated even carboxylic acids from n-decanoic to n-eicosanoic acid is discussed. Seven crystal modifications, including polymorphs and polytypes, were identified and fully characterized by the combination of calorimetric measurements (DSC) at atmospheric and high pressures, X-ray powder diffraction, FT-IR spectroscopy and scanning eléctron microscopy (SEM). All seven crystal forms, including polymorphs and polytypes, are observed at room temperature. Forms A_2 and A_{super} are triclinic, form C is monoclinic and forms E and B show both a monoclinic and an orthorhombic polytype. The triclinic modifications A_2 and A_{super} predominate for acids up to n-tetradecanoic acid ($C_{14}H_{27}O_2H$). The orthorhombic and the monoclinic forms predominate for acids from n-hexadecanoic ($C_{16}H_{31}O_2H$) up to n-octadecanoic ($C_{18}H_{35}O_2H$). When the temperature is increased, all the crystal modifications transform irreversibly to the C form. In the first part of this paper, cell parameters for the different forms are given, the observed temperatures and enthalpies of the transitions are reported and the stability of the different forms is discussed. In the second part, we state the main contribution of each technique for the identification and interpretation of the polymorphism of even numbered carboxylic acids.

Key words: Fatty acids. Polymorphism. Hexadecanoic. Octadecanoic.