

The Influence of Solidification Direction on the CET in Zn-base Alloys

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Zinc gravity casting alloys can be used for general industrial applications where strength, hardness, wear resistance or good pressure tightness is required. Zinc alloys are often used to replace cast iron because of their similar properties and higher machinability ratings.

The composition of hypoeutectic alloys is close to 4%wtAl and their aluminum content is greater than that of eutectic alloys (5%wtAl). All zinc casting alloys have dendritic/eutectic microstructures. However, hypoeutectic alloys solidify with zinc-rich dendrites, whereas hypereutectic alloys solidify with aluminum-rich dendrites.

In a solidification process, the microstructure depends on the alloy characteristics and is mainly a function of the temperature evolution ahead the solid/liquid interphase [1-3].

Among the several phenomena occurring during solidification, like solute segregation or morphology stability, one of the most important ones is dendritic growth. The most important dendrite parameters are the primary, secondary and tertiary arm spacings due to their influence on mechanical properties.

An efficient method to examine the evolution of the dendrite arms is related to the application of steady-state directional solidification with an imposed growth rate, V , and a thermal gradient, G , at the solid/liquid interphase.

In this work, Zn-Al (wt%) alloys were solidified under unidirectional solidification in a device cooled with water, in a vertical upward direction (0°), inclined at 30° and 45° to the vertical and in a horizontal upward direction (90° to the vertical). We determined the position of the transition from columnar to equiaxed structure (CET) through macro and micro-analysis, and significant thermal parameters by recording temperature-time data. The results show that the direction of dendrite growth is about that of the heat extraction and that the angle of inclination of the columnar grains with the longitudinal axis of the alloy sample coincides approximately with the angle of inclination of the furnace.

The relevance of the problem under study is justified on the basis that the solidification variables, including natural convection, affect the structures of the solid and the formation of defects. The solidification variables are also important for modeling prediction of the structure and property of a given cast piece [3-11]. The results also allow a better understanding of the conditions and mechanisms operating in a solidification with different directions.

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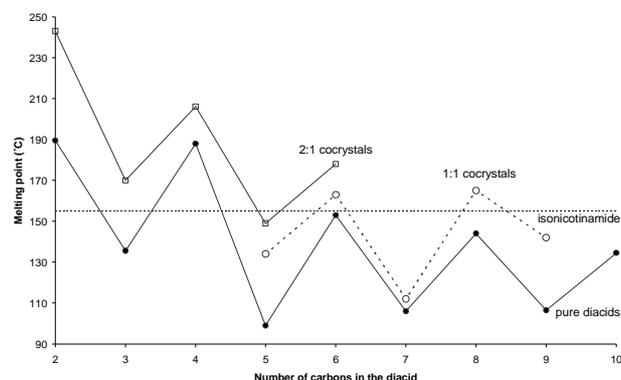
Crystal structures and properties of isonicotinamide: alkanediacid cocrystals

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The tunability of physicochemical properties of crystalline materials through controlled cocrystal formulation is an aim for both the pharmaceutical industry and crystal engineers. Cocrystals are crystalline solids that contain two or more molecular compounds that are solid under ambient conditions and have the potential to provide optimal physical properties whilst retaining the chemical properties of the individual components. The variation in composition and stoichiometry of components in these cocrystals gives us access to a range of tailored structural combinations and as such provides a route to new tunable materials.

In this poster we present the synthesis, characterisation and melting point behavior of three new 1:1 cocrystals of isonicotinamide combined with pimelic, suberic and azelaic acid. These cocrystals demonstrate robust synthon formation whilst mimicking the melting point alternation behavior of pure odd and even chain acids.

All three structures contain hydrogen-bonded chains of alternating acid and amide molecules between which acid-pyridine and acid-amide synthons are formed. Both pimelic acid and azelaic acid cocrystals form structures in which the acid moiety adopts a twisted alkyl backbone conformation similar to that observed in the pure odd alkanediacid materials. The suberic acid cocrystal differs from the other two, retaining both the elevated melting point and the planar acid conformation displayed by even alkanediacid materials in this series [1].



[1] L.J. Thompson, R.S. Voguri, L. Male, M. Tremayne, CrystEngComm 2011, 13, 4188-4195.

Properties of metal oxalate materials from electron density. Modelling the building blocks and evaluation of framework interaction

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Extensive research work has been carried out in last few decades on the synthesis and characterisation of several metal organic materials including carboxylates, phosphates, and arsenates [1]. To a large extent, the interest is due to the interesting properties possessed by the materials and potential applications, such as electrical conductivity, magnetism, photo mechanism, host-guest