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Polymorphism in L-Glutamic Acid using Combined Cooling and Antisolvent Crystallization

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ABSTRACT

L-Glutamic acid is one of the naturally occurring amino acids which shows monotropic polymorphism. It has two polymorphs α and β. α is a metastable polymorph with prism like shape, whereas β is stable polymorph with needle like shape. Though β form is the most stable form, it is fragile due to its needle like habit and hence difficult to transport. On the other hand, due to the prism like shape of α form, transportation is easier, and hence it is preferred in industries.

In this work, to obtain higher fractions of α form, combined cooling and antisolvent crystallization method is applied on L-glutamic acid where L-Glutamic acid solution is cooled from saturation temperature to lower temperature in presence of different antisolvents. DMSO, Methanol, Ethanol and Acetic acid, are used as antisolvents during L-Glutamic crystallization to investigate their effect on polymorphic outcome. DMSO was then chosen as representative case to study the influence of different stirring conditions and initial concentrations. Cooling in presence of antisolvents results in higher quantity of α form as compared to only cooling crystallization. Additionally, it is shown that cooling in presence of magnetic stirring results in higher quantity of α form as compared to stagnant conditions. Simulation studies are also done at different temperatures showing that L-Glutamic structure becomes more structured at lower temperatures. These results can be helpful in achieving better polymorphic control during crystallization of L-Glutamic acid.

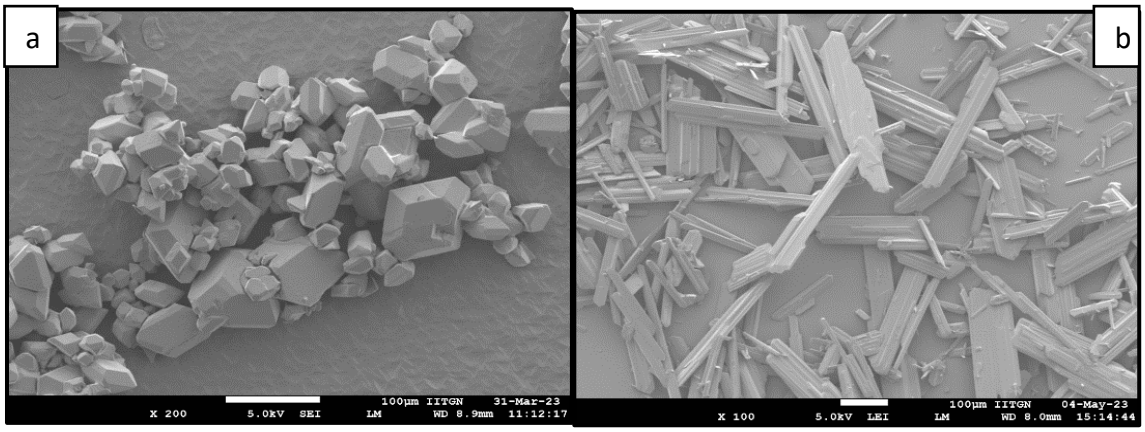

Figure: *SEM Micrographs of pure α form (a), pure β form (b) obtained using cooling crystallization*

Keywords: Crystallization, Polymorphism, L-Glutamic Acid, Cooling, Antisolvent addition, Simulation

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