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Kinetics and nucleation mechanism of carbamazepine–saccharin co-crystals in ethanol solution (Article)

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Abstract

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This study aimed to investigate the metastable zone width (MSZW) and the nucleation order of carbamazepine–saccharin (CBZ–SAC) co-crystals via slow cooling crystallisation, to obtain the kinetic value using Kashchiev–Borissova–Hammond–Roberts (KBHR) technique and to deduce the induction time, the radius of the critical nucleus and the interfacial energy of the CBZ–SAC co-crystals via fast cooling. Slow cooling experiments with cooling/heating rates of 0.8, 0.6, 0.4 and 0.2 °C min⁻¹ were applied to determine the crystallisation and the dissolution temperature of CBZ–SAC co-crystals at SAC:CBZ ratios of (3.5, 3.0, 2.5, 2.0 and 1.0) and CBZ concentrations of 19.14, 17.96, 17.06 and 15.83 mg mL⁻¹. Then, fast cooling experiments were run at CBZ concentration of 17.96 mg mL⁻¹ and SAC:CBZ mole ratio of 2.0. Nucleation kinetics, such as MSZW, nucleation order, nucleation kinetic constant and interfacial energy, was determined and analysed. KBHR method was applied to analyse the kinetics value and compared with isothermal method. The nucleation orders obtained from slow cooling method were in between 1.65 and 4.9, which were within the range for nucleation of organic compounds. The results of KBHR method in determining the kinetic values of CBZ–SAC co-crystals were similar to those of the isothermal method. © 2017, Akadémiai Kiadó, Budapest, Hungary.

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Carbamazepine Co-crystal KBHR Kinetics MSZW Nucleation

Indexed keywords

Engineering controlled terms: Amides Cobalt Cooling Enzyme kinetics Interfacial energy Isotherms Kinetics
Sugar substitutes Sugars

Compendex keywords: Carbamazepine Co-crystals Dissolution temperature KBHR Metastable zone width
MSZW Nucleation mechanism Slow cooling method

Engineering main heading: Nucleation

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