

STIRRING SPEED EFFECT ON CARBAMAZEPINE SACCHARIN (CBZ-SAC) CO-CRYSTAL CRYSTALLIZATION PROCESS

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ABSTRACT

A research was conducted to investigate the stirring speed effect on carbamazepine-saccharin co-crystal crystallization. Co-crystals had shown a significant increase as the co-crystal form has a much better property than pure API over the years of its development. The method of screening used for this study is the cooling crystallization method. Nyvlt's equation involving the maximum temperature difference between the dissolution and crystallization temperature of CBZ-SAC co-crystals with their respective cooling/heating rate was applied for the study of nucleation kinetics. The stirring speeds under study were 200, 250 and 300 rpm along with carbamazepine concentration of 17.96 mg/ml. The heating and cooling rates used were 0.2, 0.4, 0.6 and 0.8°C/min respectively. The analysis methods used to characterize the solid state co-crystal were Differential Scanning Calorimeter (DSC), Powder X-Ray Diffraction (PXRD) and Fourier Transform Infrared (FTIR) spectroscopy. The PXRD analysis has revealed that the product crystal obtained from screening was a co-crystal. From the DSC analysis, the melting point of CBZ-SAC co-crystal was found at 177°C. The functional groups found in the CBZ-SAC co-crystal formed were hydrogen bond heteromeric associated between CBZ and SAC, assessed using FTIR. The results revealed that as the speed is increased, the meta-stable zone width (MSZW) was found to be increased at the speed of 250 rpm but decreased after the speed went up to 300 rpm. The nucleation order and mass nucleation rate constant shows the opposite pattern where it decreased when the stirring speed used increased from 200 rpm to 250 rpm and increased at the speed of 300 rpm. Future studies is recommendable that the stirring speed study should be carried on at the speed of 260 to 290 rpm to investigate the point where the changes occurs.

Keywords: Co-crystal, Carbamazepine, Saccharin, Meta Stable Zone Width (MSZW), Differential Scanning Calorimeter (DSC), Powder X-Ray Diffraction (PXRD) and Fourier Transform Infrared (FTIR).