



Date: 19/08/10

Title:

Physicochemical characterisation of spray dried sulfathiazole (ST) and its corresponding sodium salt (STNA).

Principal Focus:

To determine the effect of the spray drying process on a selected sulfonamide and its corresponding sodium salt. The effect of different parameters employed in the process was also examined on both ST and STNA. The APIs were processed from ethanolic and acetic solutions and the physicochemical properties of the spray dried powders compared to the unprocessed materials.

Spray drying experimental:

1. ST and STNA 0.5% w/v feed solutions were prepared by dissolving the APIs in ethanolic and acetic solutions.
2. Spray drying of ST was performed using the following parameters: inlet temperature of 78°C, N₂ flow of 473 NI/hr, aspirator rate 100% and feed flow rate of 30%.
3. The spray drying parameters used for STNA were identical except for the inlet temperature which was set to 160°C.

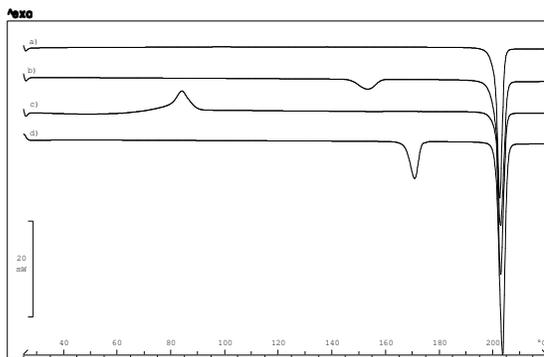


Figure 1: DSC heat flow thermograms of: (a) ST spray dried from acetone:water (t=0); (b) ST spray dried from acetone:water (t=24 hrs); (c) ST spray dried from ethanol:water (t=0); (d) ST form III (unprocessed).

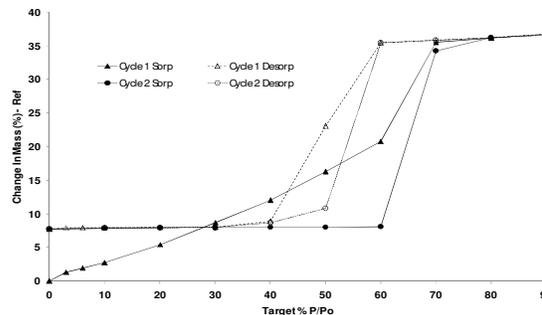


Figure 2: Sorption-desorption isotherms of STNA spray dried from ethanol: water 9:1 v/v.

Results and discussion:

The selection of acetic solutions as a solvent to process ST yielded powders with different physical properties compared to those obtained from ethanolic solutions. Pure polymorph I and amorphous ST were obtained from acetic and ethanolic solutions respectively (Fig. 1). Amorphous ST powders were unstable and tended to recrystallise rapidly at low relative humidity. Interestingly, the evolution of the amorphous material was dependent on the storage conditions. Recrystallisation to pure form I was observed when the amorphous powders were stored at 40°C and <35% relative humidity (RH). At higher RH amorphous ST recrystallised to mixture of form I and III. On the other hand, the sodium salt converted to an amorphous phase upon processing, regardless of the solvent employed. A two-fold increase in the T_g of the salt compared to the non-salt form confirmed the influence of the counterion on the thermal properties of the material as hypothesised by Tong and Zografi (1999). RH was found to have a strong plasticising effect on the spray dried salt, inducing the phase transformation of the amorphous salt into a sesquihydrate when exposed to step changes in RH in a dynamic vapour sorption apparatus (Fig. 2).

Future Work:

Develop strategies to increase the stability of the amorphous powders such as co-spray drying the sulfonamides with their corresponding sodium salts.