Poster MS4

A study on Melting Point Depression of Fatty Acids and Pluronics in Liquid or Supercritical Carbon Dioxide

Ruchir BHOMIA, Vivek TRIVEDI, John MITCHELL
University of Greenwich, Chatham, UNITED KINGDOM

✉br14@gre.ac.uk

The melting behaviour of saturated fatty acids and pluronics was investigated in liquid or supercritical carbon dioxide ($SCCO_2$). Fatty acids included in this study were lauric acid, myristic acid, palmitic acid and stearic acid while pluronics used were F-77, F-127, F-68, F-38 and F-108. The melting point of fatty acids and pluronics was determined at pressure values from (7.0 to 50.0) MPa and (8.0 to 50) MPa respectively. Unprocessed and CO_2 -processed samples of all fatty acids and pluronics were analysed by differential scanning calorimetry (DSC) and powder X-ray diffraction (XRD). A melting point depression in the range of (18.1 to 19.3) K was observed for the pluronics whereas the fatty acids showed a depression of (10.8 to 19.5) K in their melting point. The melting behaviour of pluronics in liquid or $SCCO_2$ was found to be independent of their molecular weight and Polypropyleneoxide-Polyethyleneoxide content. Conversly, the melting behaviour of fatty acids in CO_2 was found to be dependent on pressure and carbon chain length. The extent of depression in melting temperature of fatty acids was inversely proportional to the carbon chain length i.e. the longer the carbon chain length the lower the melting point depression. Melting points of all studied fatty acids were found to decrease with initial increase in pressure. In each case, a minimum was observed and melting point began to rise again with the further increase in pressure. Analysis by DSC and XRD revealed that CO_2 processing had no impact on the crystal morphology of pluronics and fatty acids. This study provides a good understanding on the melting behavior of fatty acids and pluronics in liquid or $SCCO_2$. Furthermore, this phenomenon can also be used in particle engineering at low temperatures and processing of thermolabile substances such as proteins and peptides.