Supercritical Carbon Dioxide Fractionation of Anhydrous Milk Fat

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Anhydrous milk fat (AMF), clarified butter or butter oil is widely consumed food commodity because of its long shelf-life and contribution to flavor, quality and texture of food products formulated. Milk fat has a heterogeneous nature. It contains a large variety of fatty acids with different chain lengths. Due to its complex composition, AMF has a broad melting range from −40 to +40^{o}C. These physical properties and variations, especially different melting fractions in composition, restrict the use of milk fat in food products. Each fraction may affect the functionality and behavior in foods together with the other ingredients used in the formulation. This behavior may vary with the liquid/ solid phase and crystal size formed during rapid or slow cooling and storage. Therefore, it will be better to use fractions in food products depending on the consumers demand. For this purpose, AMF was fractionated by supercritical carbon dioxide (SC-CO_2). Six fractions were produced at 40 and 60^{o}C using pressure values of 10, 20, 25, 30, 33 and 36 MPa. Composition and yield of fatty acids were evaluated at different fractionation conditions in relation to the original AMF. Short chain (C_4–C_8) and medium chain fatty acids (C_{10}–C_{14}) were decreased from fraction obtained in the order of 10 to 36 MPa, while long chain fatty acids (C_{16}–$C_{18:3}$) and unsaturated fatty acids were increased. Significant changes occurred in the chemical composition of the fractions led to distinctive differences in their thermal profile and solid fat content (SFC). Fractions obtained at 10 and 20 MPa exhibited lower melting and crystallization behaviors than those obtained above 30 MPa.