ETHENOLYSIS OF ETHYL OLEATE IN SUPERCRITICAL CARBON DIOXIDE

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The use of renewable materials has received much attention in recent years with the gradual depletion of industrial raw materials from coal and petroleum. Metathesis of unsaturated fatty acids is a route of great importance because they can be obtained from various plant oils and animal fats. Olefin metathesis is a very important organic reaction, in which olefins are converted into new olefin products via the rupture and reformation of carbon-carbon double bonds under the presence of catalyst.

Supercritical(SC) CO_2 has been used in many fields, such as extraction and separation, chemical reactions, material science, and microelectronics. It is well known that SCF technology is environmentally more acceptable. Chemical reactions in SCFs or under supercritical condition have many advantages. For example, reaction rate, yield, and selectivity can be adjusted by varying temperature and pressure; environmentally benign SCFs (e.g., CO_2, H_2O) can be used to replace toxic solvents.

There are two main types of metathesis: self-metathesis which occurs between two identical olefin molecules and cross-metathesis which occurs between two different ones. The cross-metathesis of ethene with other olefin is technologically called ethenolysis. In this work we studied the ethenolysis of ethyl oleate with and without SC CO_2 catalyzed by the first generation Grubbs catalyst benzylidene-bis(tricyclohexylphosphine) dichlororuthenium purchased from Sigma-Aldrich Inc. The catalyst loading is 1 mol% of the ethyl oleate and the initial pressure of ethene is 1.5 MPa. It was demonstrated that at 35 ^{o}C the highest yield of the product was 80% without CO_2, while the yield could exceed 90 % in the presence of CO_2. Moreover, CO_2 can also enhance the reaction rate considerably.

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