

ENZYME TREATMENT AND APPLICATION IN COMPRESSED FLUID MEDIUM

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This talk comprises a brief review of the state of the art regarding enzyme treatment in compressed fluids towards its utilization in enzyme-catalyzed reactions of great interest for chemical and food industries. In particular, great attention is devoted to oil modification, as well as production of GOS and FOS using supercritical carbon dioxide, propane, n-butane and liquefied petroleum (LPG) gas as solvent media. Enzyme behavior in compressed fluid medium is discussed in terms of the effects of system pressure and temperature, exposure time and depressurization rate. The behavior of free, immobilized and enzyme in solution are investigated in compressed fluid medium and characterized by several analytical techniques (SEM, XRD, FTIR, DSC, TGA, etc.). A variety of high-pressure equipment is shown to be useful for enzyme treatment experiments, depending on the enzyme form, varying the temperature from 35 to 75 °C, in the pressure range of 10-280 bar, exposure times from 1 to 6 h and adopting distinct decompression rates (compression/expansion cycles). Results showed that, in general, activity losses are verified for all enzymes in carbon dioxide, while the use of propane, n-butane and LPG promoted enhancements of enzyme activity and stability. In general, within the range studied, temperature and exposure times affected positively enzyme activity while the decompression rates did not demonstrate to be a relevant variable. Additionally, some applications are provided together with an industrial, pilot-plant example demonstrates the advantageous utilization of compressed fluids for enzyme treatment.

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