484f Activation of Enzymes in Hexane Using an Inert Support

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Enzymatic catalysis in solvents such as hexane allows access to reactions that can not be performed in water. Solubility problems for substrates and products can be overcome and the thermal stability of enzymes may be increased in non-aqueous solvents. Products from enzymatic catalysis can be marketed as "natural" under certain circumstances whereas products from chemical catalysis can not. However, the catalytic activity of enzymes in organic solvents is usually quite low. The highest reported activities of enzymes in solvents were achieved using co-lyophilization of enzymes with inorganic salts.

The literature suggests that the activation effect for enzyme preparations co-lyophilized from aqueous solution with inorganic salts is due to subtle interactions between the salt and the enzyme. It has been suggested that the type of salt may be important. Our hypothesis was that mass transport issues rather than salt/enzyme interactions are responsible for the activation. We used subtilisin Carlsberg with a standard activity essay to explore this idea. Our enzyme preparations made by lyophilization with fumed silica show equivalent and sometimes higher catalytic activities in hexane compared to salt-activation of the same enzyme. Our activation method does not require pre-freezing in liquid nitrogen before lyophilization as is needed with salts. Data for batch reactions and a continuous-flow packed bed reactor using our preparations will be shown. Evidence for a step change in activation once a monolayer coverage of enzyme on the support is reached will also be shown. Our activation method may be an avenue to inexpensive and highly active enzyme preparations for use in solvents.