

Asymmetric sulfoxidation of thioether catalyzed by soybean pod peroxidase to form enantiopure sulfoxide in water-in-oil microemulsions: kinetic model

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Abstract

The asymmetric sulfoxidation catalyzed by soybean pod peroxidase (SPP) in water-in-oil microemulsions were carried out with the yield of 91.56% and e.e of 96.08% at the activity of SPP of 3200 U ml⁻¹ and 50 for 5 h. The mechanism with a two-electron reduction of SPP-I is accompanied with a single-electron transfer to SPP-I and nonenzymatic reactions, indicating that three concomitant sub-mechanisms contribute to the asymmetric oxidation involving five enzymatic and two nonenzymatic reactions, which can represent the asymmetric sulfoxidation of organic sulfides to form enantiopure sulfoxides. With 5.44% of the average relative deviation, a kinetic model fitting experimental data very well was developed. The enzymatic reactions may follow ping-pong mechanism with substrate inhibition of H₂O₂ and product inhibition of esomeprazole, while nonenzymatic reactions, a power law. Those results indicate that SPP with a lower cost and higher thermal stability may be used as an effective substitute for Horseradish Peroxidase.

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