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Development of lipase-sucrose complex to improve of transesterification activity and stability in the organic solvents

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Lipases are one of the most important enzymes as industrial catalysts. When lipases are used in the presence of organic solvents, the reaction rate is remarkably increased by solubilizing the poorly soluble substrates. Furthermore, lipases can catalyze ester synthetic reactions and transesterification reactions in the presence of organic solvents. However, enzymes including lipases are generally inactivated in the presence of organic solvents by direct contact with molecules of organic solvents. Some coordinated water molecules exist around sugars such as sucrose. Thus when lipase was complexed with sucrose and used in the presence of organic solvents, coordinated water molecules around the lipase-sucrose complex might reduce direct contact between lipase and organic solvent molecules. In this study, the transesterification activity of the lipase-sucrose complex in the presence of organic solvents was examined. The lipase-sucrose complex was prepared by freeze-dry of a lipase solution containing 1% (w/v) of sucrose (mass ratio of Lipase & Sucrose is 1:130). The lipase-sucrose complex showed the higher transesterification activity than freeze-dried lipase without sucrose in the presence of n-hexane and n-hexane containing 50% (v/v) of n-octane, 1-propanol, 1-pentanol, or 1-octanol. After incubation in 100% of n-hexane, n-octane or 1-propanol at 30 °C for 24 hours, the residual transesterification activity of lipase-sucrose complex was higher than that of the freeze-dried lipase without sucrose. Furthermore, after incubation in 100% of 1-pentanol or 1-octanol, the transesterification activity of lipase-sucrose complex was also increased. In conclusion, the transesterification activity and organic solvent-stability of the lipase were successfully improved by complexation with sucrose.

Biography

Shota Kajiwara has received his Master of Engineering degree in Osaka Prefecture University, Osaka, Japan in 2016. He is currently a Doctoral student of Osaka Prefecture University. His research interest includes the stabilization of enzyme in the presence of organic solvents.

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