

# The 8th Green and Sustainable Chemistry Award

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*“Development of Environmental Benign Organic Synthesis  
Based on Advanced Biocatalysis Processes Regulated by a Chemical Method”*

The use of ionic liquids (ILs) to replace organic or aqueous solvents in biocatalysis processes has recently gained much attention and great progress has been accomplished in this area. Prof. Itoh and his team in Tottori University made a great contribution in this area of Chemistry. (1) They demonstrated an efficient lipase recyclable use system using an ionic liquid solvent system. Lipase-catalyzed transesterification of secondary alcohols proceeded smoothly in an ionic liquid and a perfect lipase-recycling system has thus been realized. (2) They discovered that a remarkable activation of a lipase was accomplished by the coating of enzyme protein with alkyl PEG sulfate imidazolium salt (IL1) while maintaining original enantioselectivity: Furthermore they found that (*R*)-pyrrolidine-substituted imidazolium cetyl-PEG10-sulfate (D-ProMe) derived from D-proline worked as a very excellent activating agent of lipase PS. (3) They demonstrated a very rapid transesterification of secondary alcohols in 2-methoxyethyl(tri-*n*-butyl)phosphonium bis(trifluoromethanesulfonyl)amide as solvent using ionic liquid coated enzyme and afforded the first example of a reaction rate superior to that in conventional organic solvent such as diisopropyl ether.

It should be emphasized that ionic liquids can be used repeatedly after simple purification process. Enzymatic reaction processes based on the concept of the Green Sustainable Chemistry have thus been accomplished using ionic liquid as a key reaction medium.