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Enzymatic Resolution/Separation of Sec-Alcohols using Green Solvents

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Enzymes can perform the resolution of sec-alcohols in a very efficient way, through the conversion of one of the enantiomers into a different chemical species. However, the subsequent physical separation of the two enantiomers often involves a series of steps. Here we address this challenge using sustainable chemistry approaches, with *rac*-1-phenylethanol as model. Immobilized *Candida Antarctica* lipase (Novozyme 435) was used to selectively convert (*R*)-1-p. Supercritical carbon dioxide (scCO₂) is highly soluble in ionic liquid (IL) media, while the reverse is not true. A stream of scCO₂ was passed continuously through the IL to selectively extract unreacted (*S*)-1-phenylethanol. The ionic (*R*)-1-phenylethanol derived ester, which is insoluble in scCO₂, remained in the IL solvent. The recovery of (*S*)-1-phenylethanol was straightforward by depressurization of the scCO₂ stream. Water was then added to the IL, to hydrolyze the ionic (*R*)-1-phenylethanol derived ester, yielding (*R*)-1-phenylethanol. scCO₂ was again used to extract (*R*)-1-phenylethanol. At the end of the process, both enantiomers of (*rac*-1-phenylethanol were obtained with high enantiomeric purity.