

Abstract

While synthetic polymers are indispensable for the sustainable transformation of our society, the increasing production needs to be combined with adequate recycling strategies. As conventional recycling processes often result in quality losses or are complicated by the presence of additives and other polymers, there is a high need for the development of new technologies. This study presents a first efficient approach to enzymatically recycle polycarbonate (PC), a high-performance polymer. Through an extensive enzyme screening, 9 cutinases were found to exhibit hydrolytic activity towards PC in aqueous buffer enabling the recovery of bisphenol A as a valuable monomer under mild reaction conditions. Notably, the enzymes ThcCut1-ACCG and LCC-ICCG demonstrated excellent performance by achieving conversions of 20-40% under optimized reaction conditions. Impressively, full conversion of PC could be achieved by supplementing dimethyl sulfoxide (DMSO; 30% (v/v)). These findings represent an excellent foundation to develop sustainable PC recycling processes for the circular economy.