Electrospun magnetic nanocellulose–polyethersulfone-conjugated *Aspergillus oryzae* lipase for synthesis of ethyl valerate

ABSTRACT

A novel greener MNC/PES membrane was developed through an electrospinning technique for lipase immobilization to catalyze the synthesis of ethyl valerate (EV). In this study, the covalent immobilization of *Aspergillus oryzae lipase* (AOL) onto an electrospun nanofibrous membrane consisting of magnetic nanocellulose (MNC) and polyethersulfone (PES) to produce EV was statistically optimized. Raman spectroscopy, Fourier-transform infrared spectroscopy: attenuated total reflection, field emission scanning electron microscopy, energy dispersive X-ray spectroscopy, thermal gravimetric analysis (TGA), and differential thermal gravimetric (DTG) of MNC/PES-AOL demonstrated that AOL was successfully immobilized onto the fibers. The Taguchi design-assisted immobilization of AOL onto MNC/PES fibers identified that 1.10 mg/mL protein loading, 4 mL reaction volume, 250 rpm stirring rate, and 50 °C were optimal to yield 72.09% of EV in 24 h. The thermal stability of MNC/PES-AOL was improved by ≈20% over the free AOL, with reusability for up to five consecutive esterification cycles while demonstrating an exceptional half-life of 120 h. Briefly, the electrospun MNC/PES fibers that immobilized AOL showed promising applicability in yielding relatively good EV levels. This study suggests that using MNC as fillers in a PES to improve AOL activity and durability for a longer catalytic process could be a viable option.