Deep eutectic solvent as a media in swelling and dissolution of oil palm trunk

ABSTRACT

Pre-treatment is a crucial step in biomass processing prior to the hydrolysis or fermentation to bioethanol. Herein, the potential of deep eutectic solvent (DES) in the pretreatment of oil palm biomass were described. The mechanism of swelling and dissolution of oil palm trunk (OPT) was studied under optical microscopy. The OPT fibres were stirred and heated at 100 °C in choline chloride:glycerol (ChCl:Gly), choline chloride:ethylene glycol (ChCl:EG), ethylammonium chloride:glycerol (EAC:Gly) and ethylammonium chloride:ethylene glycol (EAC:EG) with 1:2 molar ratio each. All DESs tested had showed homogenous swelling and disintegration of small fragments interaction mode with OPT. There were more small fragments observed in EAC-based DES compared to ChCl-based DES. This finding supports the result for the percentage of dissolution where OPT in EAC-based DES recorded higher dissolution with 55% and 50% in EAC:EG and EAC:Gly respectively whereas ChCl-based DES recorded only 33% and 29% in ChCl:EG and ChCl:Gly, respectively. In ChCl-based DESs the fragmentations were accompanied by large unswollen section of fibres. The formation of small fragments indicates that the fibres experienced a fast dissolution. Therefore, the EAC-based DESs proved to be a better swelling and dissolution media for oil palm biomass pretreatment compared to ChCl-based DES.

Keywords: Deep eutectic solvent; Oil palm biomass; Dissolution; Swelling; Pre-treatment