

Removal and recovery attempt of liquid crystal from waste LCD panels using subcritical water

ABSTRACT

With the advancement of the fourth industrial revolution, the demand for LCD has widely accelerated as monitoring screens for computers and cell phones. Consequently, old LCD panels are expected to end up as a tremendous amount of e-waste. Apart from transparent electrodes and transistor, waste LCD panel also contains hazardous liquid crystal compound that can contaminate the landfill site. Thus, removing the material from waste LCD was investigated. In this study, water at subcritical state was applied at temperatures between 100 and 360 °C. Initially, the liquid crystals were extracted using toluene and were used to compare with subcritical water. The specific compounds of the liquid crystals were not identified. The liquid crystals (12 mg/g-LCD) were entirely removed from the LCD panel when treated above 300 °C by means of extraction with the subcritical water. Although liquid crystal was successfully removed, recovery was complicated due to the degradation of liquid crystals above 250 °C. A recovery of 70% was obtained at 250 °C without deformation of the molecules. Consequently, this study has shown that although it is not practical to recover LC from LCD panel waste using subcritical water, liquid crystals can be removed efficiently. This method is auspicious in reducing hazardous liquid crystal from waste LCD panel before their disposals at landfill sites.

Keyword: Subcritical water; Liquid crystal; Waste LCD Panel; CF glass; TFT glass