Novel Biodegradable Fluorescent Polymers for Anti-Counterfeiting Applications

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According to recent reports, the global economic losses caused by product counterfeiting reached 1.82 trillion USD in 2020. One of the newest and promising methods for anti-counterfeiting is fluorescent polymers. However, the main drawback of using fluorescent polymers is their non-biodegradable nature. In this research, biodegradable polymers were prepared from citric acid and glycerol in the presence of hydrochloric acid as a catalyst. To induce the fluorescent property, fluorescent carbon nano-dots (CNDs) were added, that are also prepared from citric acid. For the first time biodegradable polymers were combined with fluorescent CNDs. Two samples were characterized using FT-IR, TGA and fluorometer. FT-IR results showed disappearance of OH groups which turned into ester groups. TGA results showed stability of the samples, as they were stable until 200 ° C. Fluorimeter results showed that the maximum light emission of the polymers is on average between 420 – 520 nm, which emits with the color light green or blue. In conclusion, due to the fact that the samples have been prepared by citric acid and glycerol, both are biodegradable which means that the polymer samples are biodegradable. Fluorescent polymers can be applied in many products such as: banknotes, passports, ID’s, logo’s and anything that can be counterfeited. This could potentially save global economies many millions of dollars.