

ABSTRACT

In the last couple of years, graphene oxide (GO) has attracted a great number of researchers interest due to its unique properties. GO are often incorporated into composites as a support for biomedical applications. Polymer composites can be processed easily in various ways depending on the needs. The objective of this work is to find the optimum percentage of GO used in a Poly (ϵ -caprolactone) (PCL) composite. Three variations of PCL-GO composite (0.5%, 1% and 2%) were tested using scanning electron microscopy (SEM), metallography, electrochemical impedance spectroscopy (EIS), Ultraviolet Visible Spectrophotometer (UV-Vis), tensile test and hardness test.

In this study, GO was synthesized from pure graphite powder using modified Hummer's method. PCL-GO composite was prepared by dissolving PCL pellets in chloroform and incorporating synthesized GO powder into the solution by stirring. The mixture was stirred then poured into a Petri dish to solidify.

Metallographic images showed that GO could be dispersed homogenously in PCL matrix as well as the effects of GO as the nucleating agent. SEM did not show the dispersion of GO in PCL matrix clearly since both materials were made out of the same elements. However, EDX results indicated the presence of impurities on the composite. These impurities might be the residue left on the surface of the synthesized GO. When the synthesized GO was tested using UV-Vis spectrophotometry, the absorbance peak measured was different compared to other studies. There was an increase in the impedance of PCL when the content of GO in the composite is 0.5%. However, when the percentage of GO is higher than 0.5%, EIS results showed a decrease in the impedance of PCL.

Mechanical testing of the composite showed an increase of hardness and elastic modulus of PCL with 2% of GO. However, the composite with 2% GO could withstand significantly lower stress compared to pure PCL as well as decreased the elongation of PCL drastically.