Optical Properties and Characterization of Graphene Oxide-Chitosan Composites through Tensile Testing, TGA/FTIR Analysis

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Chitosan is a natural polysaccharide composed of randomly distributed β-(1-4)-linked D-glucosamine and N-acetyl-D-glucosamine units. Chitosan is obtained by partial deacetylation of chitin in basic media. Chitin, a well-known polysaccharide, forms structural components of many animals, such as exoskeletons. In the present study, we investigated physical, chemical and mechanical properties of graphene oxide-chitosan (GO/Ch) hydrogel films. Nowadays, graphene based biocomposites have generated a huge interest in the field of materials science, physics, chemistry and biotechnology. The oxidized form of graphene is graphene oxide and it easily disperses in organic solvents and water with the help of its functional groups [1]. In order to prepare GO/Ch films, graphene oxide was added to 1% (v/v) acetic acid solution having a concentration of 80 µg/mL in 1% (w/v) chitosan solution. After continuously mixing, these chitosan solutions were poured into petri dishes and dried in a laboratory refrigerator until they become a thin film. Chitosan films were dipped into 1% or 20% (w/v) sodium sulfate crosslinking solutions and ionically crosslinked at room temperature for one hour. Thermal stability of chitosan and GO/Ch films were studied by thermogravimetric analysis (Figure 1) and were characterized using FTIR spectroscopy. In order to evaluate mechanical properties, tensile test was applied to the films. Tensile modulus and resilience parameters were calculated from linear elastic regions of stress-strain curves of films. Optical properties of both chitosan and GO/Ch films were determined from the transmission measurement in the range of 200-800 nm. The effect of graphene oxide dopant on energy gap has been examined for chitosan films. In conclusion, chitosan and GO/Ch films were doped with graphene oxide and then these biomaterials were characterized by various methods.

References

[1] Dimitrios Konios et al., Journal of Colloid and Interface Science, **430** (2014) 108-112.

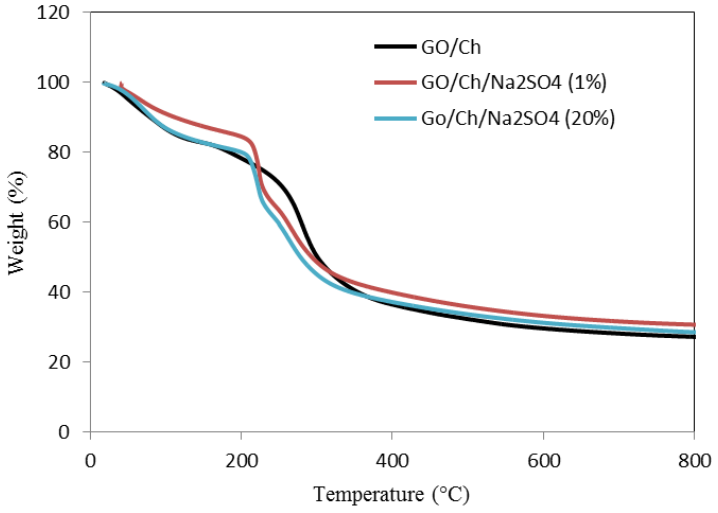

Figure 1: TG curves of GO/Ch, GO/Ch/Na_2SO_4 (1%) and GO/Ch/Na_2SO_4 (20%) films.