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Synthesis of bio-nanocomposites of chitosan for different biomedical applications

Ebtesam Mohammed Mahmoud Alshanqiti
King Abdulaziz University, Saudi Arabia

In the current work, Chitosan (CS) underwent modification with Alginic acid (AG), Hydroxyapatite (HA), multi-walled Carbon Nanotubes (CNT) and cross-linked with Glutaraldehyde (GA). All products were characterized and compared with blank CS. All materials showed the characteristic bands of FT-IR spectroscopy. Thermal degradation of modified CS was also investigated by thermal analysis. There was a slight weight loss % up to 240°C followed by Extensive Weight Loss (EWL) % up to 420°C. After that, there was a slight weight loss until the end of measurement at 700°C. EWL % depends on the modifier content. Generally, modified CS is more thermally stable than the unmodified ones. For CS/AG blends, thermal stability was higher for 10% AG content than others for both cross-linked and uncross-linked samples. In case of CS/HA composites, 20% HA modified CS showed higher thermal stability than others with no significant difference among them but significant if compared with the unmodified CS. For CS/HA/CNT composites, CNT helps samples to be thermally more stable than CS/HA composites. It would be more beneficial to use CNT only in the composite formation but the functions supplied to the composite by HA are sometimes crucial where the chemical structure and features of HA are required to be involved in the composite characteristics. Ability of matrices to uptake metal ions was determined by using Cu (NO_3) and it could be arranged as CS/AG/GA>CS/GA>CS/HA/CNT/GA>CS/HA/GA. Modified CS was used for drug delivery by using 5-Fluorouracil (FU) as antitumor model drug. Most of FU was released within 24 hours while maximum release was after 48 hours. It could be concluded that the ease of release of FU from the investigated matrices could be arranged from the fastest to the slowest matrix in the order of P111F>P121F>P311F>P411F>P321F>P421F.

bassomtyi@hotmail.com

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