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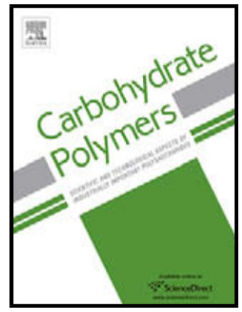

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Sodium alginate/graphene oxide composite films with enhanced thermal and mechanical properties

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Abstract
Sodium alginate / graphene oxide (Al / GO) nanocomposite films with different loading levels of graphene oxide were prepared by casting from a suspension of the two components. The structure, morphologies and properties of Al / GO films were characterized by Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), Scanning (SEM) and Transmission electron microscopy (TEM), thermal gravimetric (TG) analysis, and tensile tests. The results revealed that hydrogen bonding and high interfacial adhesion between GO filler and Al matrix significantly changed thermal stability and mechanical properties of the nanocomposite films. The tensile strength (σ) and Young's modulus (E) of Al films containing 6 wt % GO increased from 71 MPa and 0.85 GPa to 113 MPa and 4.18 GPa, respectively. In addition, TG analysis showed that the thermal stability of Al / GO composite films was better than that of neat Al film.

Keywords: sodium alginate; graphene oxide; film; mechanical properties

Introduction
Alginates as a star in biomaterials research have been attracting tremendous attention in the past few years in various fields of biomedicine (Augst, Kong, & Mooney, 2006). They have been found widespread applications in scaffolds for tissue engineering, delivery vehicles for drugs, and as model extracellular matrices for biological studies (Augst, Kong, & Mooney, 2006; Hua, Ma, Li, Yang, & Wang, 2010; Tezcan, Gunister, Ozen, & Erin, 2012; Rowley, Madlambayan, & Mooney, 1999; Rani, Mishra & Sen, 2012). Biomaterials for tissue engineering require tight control of a number of properties including mechanical stiffness, maintain physical integrity or bear loads until they are replaced by newly formed tissue, swelling, and cell attachment. Alginates themselves display some unsatisfactory properties such as poor mechanical strength and loss of structural integrity which limits the applications (Rani, Mishra & Sen, 2012). Currently, much effort has been made for improving the performance of alginates tissue engineering scaffolds. Compounding of alginates with other polymers such as pectin (Beyer, Reichert, Heurich, Jandt, & Sigusch, 2010), chitosan (Li, Ramay, Hauch, Xiao, & Zhang, 2005), or polyvinyl alcohol (Bichara et al., 2010) has been found to provide just marginal effect. Successful attempts involved the embedding of alginates with inorganic materials. Carbon