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Chemical modification of nanocellulose for nanocomposites

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Nanocellulose (NC) has attracted a great deal of interest in the nanocomposite science due to its availability, biodegradability and renewability. Nanoscale dimensions, high surface area, unique morphology, low density, and impressive mechanical properties, together with possibility of modification give nanocellulose a great potential as reinforcement agent in composites. However, some of the major disadvantage of the NC-reinforcing filler represents its polar and hydrophilic nature, which inhibit homogeneous dispersion in nonpolar polymer matrices. In order to improve the interfacial interaction/reactivity between nanocellulose and polymer matrix, cellulose nanocrystals were modified with fatty acids residues containing reactive vinyl groups as active centres involved in copoly-merisation reaction with unsaturated polyester resins. Two methods of NC modification are performed: direct esterification with oleic acid, linseed, or sunflower oil fatty acids, and esterification/amidation with maleic acid/ethylene diamine (MA/EDA) bridging group followed by amidation with methyl ester of fatty acids.

Hemijska modifikacija nanoceluloze za primenu u nanokompozitima

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Nanoceluloza (NC) privlači veliko interesovanje u nauci o nanokompozitima, zahvaljujući svojoj dostupnosti, biodegradabilnosti i obnovljivosti. Nanodimenzije, velika specifična površina, jedinstvena morfologija, mala gustina i impresivna mehanička svojstva, zajedno sa mogućnostima modifikacije daju nanocelulozi veliki potencijal za primenu kao ojačavajućeg agensa u kompozitima. Međutim, neki od glavnih nedostataka nanoceluloze za primenu kao ojačavajućeg sredstva predstavljaju njena polarna i hidrofilna priroda koja onemogućava njenu homogenu disperziju u nepolarnim polimernim matriksima. U cilju poboljšanja interfazne interakcije/reaktivnosti između nanoceluloze i polimernog matriksa, nanokristalna celuloza je modifikovana ostacima masnih kiselina koje sadrže reaktivne vinilne grupe kao aktivne reaktivne centre koji su uključeni u reakciju kopolimerizacije sa nezasićenim poliestarskim smolama. Dve metode modifikacije nanoceluloze su primenjene: direktna esterifikacija oleinskom kiselinom i masnim kiselinama lanenog i suncokretovog ulja, kao i esterifikacija/amidovanje preko tzv. linkera koji sadrži ostatke maleinske kiseline i etilen-diamina (MA/EDA), a zatim amidovanje metil estrima masnih kiselina.