



Recent advance in research on halloysite nanotubes-polymer nanocomposite



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ABSTRACT

Halloysite nanotubes (HNTs) are novel 1D natural nanomaterials with predominantly hollow tubular nanostructures and high aspect ratios. Due to their high mechanical strength, thermal stability, biocompatibility, and abundance, HNTs have a number of exciting potential applications in polymer nanocomposites. In this article, we review the recent progress toward the development of HNTs-polymer nanocomposites, while paying particular attention to interfacial interactions of the nanocomposites. The characteristics of the HNTs relative to the formation of the polymer nanocomposites are summarized first. The covalent or non-covalent functionalization methods for HNTs and various fabrication approaches for HNTs-polymer nanocomposites are introduced afterward. Polymer nanocomposites reinforced with HNTs possess highly increased tensile and flexural strength, elastic moduli, and improved toughness. HNTs-polymer nanocomposites also exhibit elevated thermal resistance, flame retardance and unique crystallization behavior. Due to the tubular microstructure and the biocompatibility of HNTs, HNTs-polymer nanocomposites have demonstrated good drug encapsulation and sustained release abilities, gaining them extensive use as tissue engineering scaffolds and drug carriers. Finally, we summarize the characteristics of HNTs-polymer nanocomposites and predict for the development of the potential applications in high-performance composites for aircraft/automobile industries, environmental protection, and biomaterials.

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Contents

1. Introduction	1500
2. Characteristics of HNTs relative to formation of polymer nanocomposites	1501
2.1. Tubular microstructure	1501
2.2. Relatively "hydrophobic"	1503
2.3. Relatively low tube-tube interactions	1503
2.4. Reinforcing	1503
2.5. Flame retardance	1503
2.6. Hydroxyl groups distribution	1503
2.7. Negatively charged surfaces	1503

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2.8.	Electrophilic.....	1503
2.9.	Porosity and the surface defects.....	1503
2.10.	Abundant deposition, easily available and cheap.....	1504
3.	Functionalization of HNTs for polymer nanocomposite preparation.....	1504
3.1.	Purification of HNTs.....	1504
3.2.	Covalent functionalization.....	1504
3.2.1.	Silane coupling.....	1504
3.2.2.	Surface graft polymerization.....	1506
3.2.3.	Covalently grafting phosphonic acid.....	1507
3.3.	Non-covalent functionalization.....	1508
3.3.1.	Non-covalent functionalization based on electron transfer interactions.....	1508
3.3.2.	Non-covalent functionalization based on hydrogen bonding interactions.....	1508
3.3.3.	Non-covalent functionalization based on electrostatic attraction interactions.....	1508
3.3.4.	Intercalation of HNTs.....	1508
3.4.	Enlargement of the lumen in HNTs or opening the inner-pores.....	1508
4.	Main strategies for the fabrication of HNTs-polymer nanocomposites.....	1509
4.1.	Processability.....	1509
4.2.	Approaches for fabricating HNTs-polymer nanocomposites.....	1510
4.2.1.	Solution processing.....	1510
4.2.2.	Melt processing.....	1511
4.2.3.	In situ polymerization.....	1511
4.2.4.	Electrospinning.....	1511
4.2.5.	Melt spinning.....	1512
4.2.6.	LbL technique.....	1513
4.2.7.	Electrophoretic deposition.....	1513
5.	Properties of HNTs-polymer nanocomposites.....	1513
5.1.	Mechanical reinforcement.....	1513
5.1.1.	HNTs loading.....	1514
5.1.2.	Dispersion.....	1516
5.1.3.	Interfacial bonding.....	1516
5.2.	Thermal stability.....	1517
5.3.	Crystallization behavior.....	1518
5.4.	Flame retardance.....	1518
5.5.	Other properties.....	1519
5.5.1.	Coefficient of thermal expansion.....	1519
5.5.2.	Dielectric properties.....	1519
5.5.3.	Wettability properties.....	1519
5.5.4.	Self-healing properties.....	1519
6.	Biomedical applications of HNTs-polymers nanocomposites.....	1519
6.1.	Tissue engineering scaffold.....	1520
6.2.	Drug/DNA carrier.....	1520
6.3.	Cancer cell isolation.....	1521
6.4.	Bone implants.....	1521
6.5.	Cosmetic applications.....	1521
7.	Conclusion and future prospects.....	1521
	Acknowledgements.....	1522
	References.....	1522

Nomenclature

AEAPS	[3-(2-aminoethylamino) propyl]trimethoxysilane
AIBN	azo-bis-isobutyronitrile
APS	3-aminopropyltrimethoxysilane
APTES	(3-aminopropyl)triethoxysilane
ATRP	atom transfer radical polymerization
BBT	2,5-bis(2-benzoxazolyl) thiophene)
BDP	bis(diphenyl phosphate)
BNNTs	boron nitride nanotubes

C.O.F	coefficient of friction
CBS	N-cyclohexyl-2-benzothiazole sulfonamide
CNTs	carbon nanotubes
CTE	coefficient of thermal expansion
DCM	dichloromethane
DDS	drug delivery systems
DMF	dimethyl formamide
DPG	diphenyl guanidine
DRIFTS	diffuse reflectance infrared Fourier transform spectroscopy

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