

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

قال تعالى: (أَتُونِي زُبَرَ الْحَدِيدِ حَتَّىٰ
إِذَا سَاوَىٰ بَيْنَ الصَّدَفَيْنِ قَالَ انْفُخُوا
حَتَّىٰ إِذَا جَعَلَهُ نَارًا قَالَ آتُونِي أُفْرِغَ
عَلَيْهِ قِطْرًا [\(96\)](#) فَمَا اسْتَطَاعُوا أَنْ
يَظْهَرُوهُ وَمَا اسْتَطَاعُوا لَهُ نَقْبًا [\(97\)](#))

صدق الله العظيم

سوره الكهف

Dedication

- ▮ To my father whose loving care and encouragement was with me all his life but he did not see what he has instilled in me.
- ▮ To my beloved mother who had to bear the time of hardship and whose patience supported me in my life journey.
- ▮ To my brothers and sisters, for all the support and love that they have given me throughout my life.
- ▮ To my wife (Sana'a) whose love and encouragement has exceeded all my expectations.
- ▮ To my daughter (Fatima) who brings light to my days.

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Abstract

Nanocomposite material which contains inorganic nanolayer clay and organic polymer has attracted considerable attention in recent years. Particularly, intercalation of organic polymer into inorganic layered host

lattice has approved to be an effective way to construct inorganic–organic nanosystem. The Raman and FTIR spectra of kaolinite (layers of silicate with composition $A1_2Si_2O_5(OH)_4$, having a diameter of $5\text{--}10\ \mu m$) were reported. Kaolinite was treated by adding dimethylsulfoxide (DMSO) as an aqueous system to expand the interlayer basal spacing. The basal spacing was increased from 7.15 to 11.2 Angstrom. This increase in basal spacing was measured using X-ray powder diffraction (XRD) method. In the OH stretching region, a Raman band of kaolinite was observed at $3624\ cm^{-1}$, and at $3481\ cm^{-1}$ after being modified. The IR spectra of kaolinite show four and five bands for OH stretching respectively before and after modification. The organic molecules-modified kaolinite (Kaolinite+DMSO) was then used as clay precursor to synthesize the polymethylmethacrylate (PMMA)/kaolinite intercalation nanocomposites via solution intercalation. This study has covered eight nanocomposites samples classified into two sets, the first of which contains four samples with different ratios of (kaolinite+DMSO)/PMMA while the other contain PMMA and pristine kaolinite. Transmission electron microscope (TEM) was also used to characterize the samples.

المستخلص

إن المواد ذات التركيب النانومتري والتي تحتوي على مركبات لاعضوية (طبقات نانومترية) وبوليمرات عضوية نالت اهتماماً كبيراً في السنوات الأخيرة. وبصفة خاصة فقد ثبت إن إقحام البوليمرات العضوية داخل الطبقات الشبكية

المضيفة يمثل طريقة فاعلة في تركيب الأنظمة العضوية - اللاعضوية النانومترية.

مطيافية ليزر رامان و تحويلات فورير للأشعة تحت الحمراء للكولونايت (طبقات من السيليكات ذات التركيب $A1_2Si_2O_5(OH)_4$ و بقطر 5 - 10 مايكرومتر) قد رصدت في هذه الدراسة.

عولج الكولونايت بغمره في ثنائي ميثيل أكسيد الكبريت لتوسيع الطبقات الداخلية. و قد إزدادت الطبقات الداخلية للكولونايت إتساعا من 7.15 الى 11.2 انجستروم. و قد تم قياس هذا الإتساع بواسطة جهاز حيود الأشعة السينية. بإستخدام مطيافية ليزر رامان، لوحظ خط طيف مجموعة الهيدروكسيل في الكولونايت عند 3624 سم⁻¹ , وبعد معالجة الكولونايت بثنائي ميثيل أكسيد الكبريت لوحظ خط طيف الهيدروكسيل عند 3481سم⁻¹. في مطيافية تحويلات فورير للأشعة تحت الحمراء ظهر للكولونايت أربعة خطوط طيف للهيدروكسيل وبعد المعالجة ظهرت خمسة خطوط طيف.

إن جزئيات الكولونايت العضوية المعدلة (كولونايت + ثنائي ميثيل أكسيد الكبريت) أستخدمت كمادة أساسية لإقحام البوليمر مع الكولونايت في تركيب نانومتري عن طريق الإقحام بالمحلول.

إستخدمت في هذه الدراسة ثمان تركيبات نانومترية وزعت على مجموعتين, مجموعة أحتوت على أربعة نسب مختلفة من الكولونايت زائداً ثنائي ميثيل أكسيد الكبريت مع البولي ميثيل ميثا أكريلات بينما أحتوت المجموعة الأخرى على البولي ميثيل ميثا أكريلات والكولونايت الخام. كما إستخدام أيضاً المايكروسكوب الإلكتروني لقياس حجم جزئيات الكولونايت.

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