UNIVERSITI TEKNOLOGI MARA

INTERCALATION OF 2-HYDROXY-1,4-NAPTHOQUINONE INTO LAYERED DOUBLE HYDROXIDES

NUR MUSHIRAH BT ISMAIL

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a panel of Examiners has met on 20th November 2014 to conduct the final ecamination of Nur mushirah Bt Ismail on her Master of Science thesis entitled " Intercalation of 2-Hydroxy-1, 4-Napthoquinone into Layered Double Hydroxides" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of examiners was as follows:

Zaini bin Hamzah , PhD
Associate Professor
Faculty of Applied Science`
Univerisiti Teknologi MARA
(Chairman)

Faujan bin Hj Ahmad , PhD
Professor
Faculty of Applied Science
Universiti Teknologi MARA
(Internal Examiner)

Mohd Ambar Yarmo,PhD
Professor
Faculty of Science and Technology
Universiti Kebangsaan Malaysia
(External examiner)

SITI HALIJJAH SHARIFF, PhD
Associate Professor
Dean
Institute of Graduate Studies
Universiti Teknologi MARA
Date: 14th January 2016

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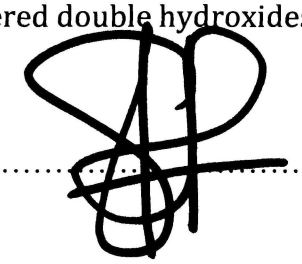
Name of Student	:	Nur Mushirah bt Ismail
Student I.D. No.	:	200255986
Programme	:	Master of Science – AS780
Faculty	:	Applied Sciences
Thesis Title	:	Intercalation of 2-hydroxy-1,4-napthoquinone into layered double hydroxides
Signature of Student	:	
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ABSTRACT

Recently, more attention is given to LDHs containing drug molecules due to its unique properties. LDH is a one class of drug delivery vehicle that has received more attention because it can accommodate polar organic compounds between their layers and form a variety of intercalated compounds. Intercalation compounds with biologically active species could thus provide composites with ability to control the drug release. This study focuses on the intercalation of 2-hydroxy-1, 4-napthoquinone into zinc-aluminium layered double hydroxides and magnesium-aluminium layered double hydroxides. In this study, original layered double hydroxides were prepared by used of co-precipitation method and its intercalated product were prepared by used of co-precipitation and ion exchange methods. Various synthesize parameters affecting the characteristic of layered double hydroxides and its intercalated products were also studied which includes the type and the ratio of metal solution, aging temperature and the intercalation method. Characterizations of the original layered double hydroxides and its intercalated product was carried out by used of Powder X-ray diffractometer (PXRD), Fourier transform infrared spectroscopy (FTIR), Field emission scanning electron microscope (FESEM) and Thermo gravimetric/Differential scanning calorimetry analysis (TGDSC). The presence of sharp peaks in the X-Ray diffractograms of layered double hydroxide shows that the synthesized LDHs have high crystallinity and the peaks were strongly dependents on the metal ratios and the synthesize temperature. The basal spacing of the LDHs increased with an increased in the metals ratio (M^{2+}/M^{3+}) and the results of the study indicated that, layered double hydroxides that synthesized at a ratio of 4 showed a better crystallinity as compared to other ratios and was subsequently chosen for the intercalation with of 2-hydroxy-1, 4-napthoquinone. Intercalations of 2-hydroxy-1, 4-napthoquinone into LDHs were carried out by used of two methods which are co-precipitation and ion-exchange. The basal spacing values ($d003$) that obtained from XRD shows that the intercalation process by used of co-precipitation method is better as compared to ion-exchange method. The FTIR spectrum of the intercalated product showed the resemblance peak of layered double hydroxides and 2-hydroxy-1, 4-napthoquinone which confirmed the intercalation of 2-hydroxy-1, 4-napthoquinone between the layers of layered double hydroxide. The thermal analysis of intercalated products suggests that, the thermal stability of 2-hydroxy-1, 4-napthoquinone is greatly improved after intercalation between the layers of layered double hydroxide. The released rate of 2-hydroxy-1, 4-napthoquinone into aqueous release medium increased with an increased in contact time between the intercalated products and aqueous release medium. A maximum percentage of released are achieved at 90 minutes for pH 10, 480 minutes for pH 7 and 540 minutes for pH 4. The release profile of the 2-hydroxy-1, 4-napthoquinone from the layer of layered double hydroxide was determined from the fitted selected various models. Based on the r^2 values obtained from the various model, it can be deduced that the release of 2-hydroxy-1, 4-napthoquinone into an aqueous release medium at different pH from the layer of layered double hydroxide can be described by first order kinetics. This study shows that LDHs can be used as a carrier for controlled release formulation for 2-hydroxy-1, 4-napthoquinone.

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