Zoom Meeting

Manager

SAKDINUN NUNTANG Conf#13

Presenter

Presenter

Keynote

Keynote

Kalyan Chakrab...

Kalyan Chakraborty

27°

Search

ENG

8:13 AM
4/20/2024

The 6th International Conference on Material Engineering Research (4th ICMER 2024)

2024.04.20		
Time	**Activity**	**Location**
10:00 ~ 14:00	On-site Registration (Hallway)	Ramada Plaza Jeju Mara Hall
10:20 ~ 10:30	Opening Ceremony	
10:30 ~ 11:00	Keynote Speech (by. Prof. Amr Mady)	
11:00 ~ 12:00	Oral Session_01	
12:00 ~ 13:30	Photo Shoot Time / Lunch	
13:30 ~ 14:45	Oral Session_02	
14:45 ~ 15:00	Coffee Break	
15:00 ~ 17:45	Remote Session	
17:45 ~ 18:00	Best Paper Award & Closing Ceremony	

The ICMER Conference Time Table

Registration	**10:00**	**~**	**14:00**	**Ramada Plaza Jeju, Mara Hall**			
Opening	**10:20**	**~**	**10:30**	**Opening Ceremony**			
Keynote Speech	**10:30**	**~**	**11:00**	**Prof. Amr Mady**			
Session	**Time**			**Paper #**	**Presenter**	**Country**	**Paper Title**
Oral Session_01 (On-site)	**11:00**	**~**	**11:15**	Conf#01	Marianne Too Shing Mei	Malaysia	Validity and Reliability of a Conceptual Framework on Enhancing Learning for Students via Kinect
	11:15	**~**	**11:30**	Conf#02	Leonardo Pagnotta	Italy	On Selecting Packaging Materials
	11:30	**~**	**11:45**	Conf#03	Leni Rumiyanti	Indonesia	Effect of Benzotriazole-Silver-Based Capping System on Porosity of Mesoporous Silica Nanoparticles Synthesized using Eco-Friendly Materials of Rice Husk
	11:45	**~**	**12:00**	Conf#04	ARIUNBOLOR Purvee	Mongolia	Microstructure and Mechanical Properties of 28 % High Chromium White Cast Iron
Lunch	**12:00**	**~**	**13:30**	**Photo Shoot Time at Mara Room & Lunch Buffet**			
Oral Session_02 (On-site)	**13:30**	**~**	**13:45**	Conf#05	Kuo-Chien Liao	Taiwan	Real-Time Detection of Aircraft Surface Damages Using UAV-Based Aerial Imaging with YOLOv8
	13:45	**~**	**14:00**	Conf#06	Kaung-Jau FANN	Taiwan	Study on Imposing Initial Tension during Coiling Helical Tensile Springs
	14:00	**~**	**14:15**	Conf#07	Russlan Jaafreh	Korea	A perspective on data as a cornerstone in material informatics: the what, where and how
	14:15	**~**	**14:30**	Conf#08	Timo Rautio	Finland	Characterization and Optimization of Mechanical Properties in Laser Powder Bed Fusion Manufactured 316L Stainless Steel
	14:30	**~**	**14:45**	Conf#09	Mikko Hietala	Finland	Analysis of Mechanical Properties and Fatigue Resistance in Laser Welded WAAM Ultra-High-Strength Steel
Break	**14:45**	**~**	**15:00**	**Coffee Break & Preperation for Remote Session**			
Remote Session	**15:00**	**~**	**15:15**	Conf#10	Prajakta Mane	India	Correlation of Wear Behavior of PBT/PC Blend with Crystallographic Structure: A Comprehensive Study on Wear Rate and Crystal Structure
	15:15	**~**	**15:30**	Conf#11	Kim Janzel Obdin	Philippines	Design and development of small-scale, industrial compression molding machine for bamboo biocomposite boards
	15:30	**~**	**15:45**	Conf#12	Ernestos Sarris	Greece	The effect of polymer amendment on the colloidal properties of a waste K+-rich bentonite for water-based drilling fluid applications
	15:45	**~**	**16:00**	Conf#13	Sakdinun Nuntang	Thailand	Developing a Highly Effective Sulfonic Acid –Functionalized NR/WMS Nanocomposites for Biodiesel Production
	16:00	**~**	**16:15**	Conf#14	Kalyan Chakraborty	India	Optimal selection of machining parameters for minimization of elementary energy consumption during machining of 304 austenitic stainless steel
	16:15	**~**	**16:30**	Conf#15	Pongpak Lap-Arparat	Thailand	Computational Study of the Influence of Crack Orientation in SCM440 Cracked Shaft on Strain Alteration under Transverse Excitation
	16:30	**~**	**16:45**	Conf#16	Toshio Haga	Japan	Adhesion of Aluminum Alloy to Tip of Nozzle Plate of Vertical Type High Speed Twin Roll Caster
	16:45	**~**	**17:00**	Conf#17	Yen An-cheng	Taiwan	The Investigation of Heat Resistance of plant fiber sandwich panel with flame retardant core
	17:00	**~**	**17:15**	Conf#18	Mohammed Ridha Jawad Al-Tamee	Iraq	Impact of various combustion chamber exhaust temperatures on a combined Bryton-ORC energy recovery system
	17:15	**~**	**17:30**	Conf#19	Showna Lee T. Sales	Philippines	Extraction and Characterization of Cellulosic Fiber from Banana, Sugarcane, and Napier Grass
	17:30	**~**	**17:45**	Conf#20	Ardvin Kester S. Ong	Philippines	Tensile Strength and Flexibility Characterization of Biodegradable Plastic from Avocado (Persea Americana) Seed
Closing	**17:45**	**~**	**18:00**	***Best Paper Award & Closing Ceremony***			

Please attend to the conference presentation Room **10 minutes** a head of time. Exceptionally, your presenting time might be earlier than above schedule because some of presenters might absent with their special reasons. Presenter must stand by at the Session Room during each session.

For Remote Presenters : The conference date is on this Saturday (**April 20, 2024**) **10:00 a.m** at Korea time
So please check the your country's time and presenetation time.

Developing a Highly Effective Sulfonic Acid –Functionalized NR/WMS Nanocomposites for Biodiesel Production

Sakdinun Nuntang[1, a *], Satit Yousatit[2,b] and Chawalit Ngamcharussrivichai[3,c]
[1]Industrial Chemistry Innovation Program, Faculty of Science, Maejo University, Chiang Mai 50290, Thailand
[2]Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

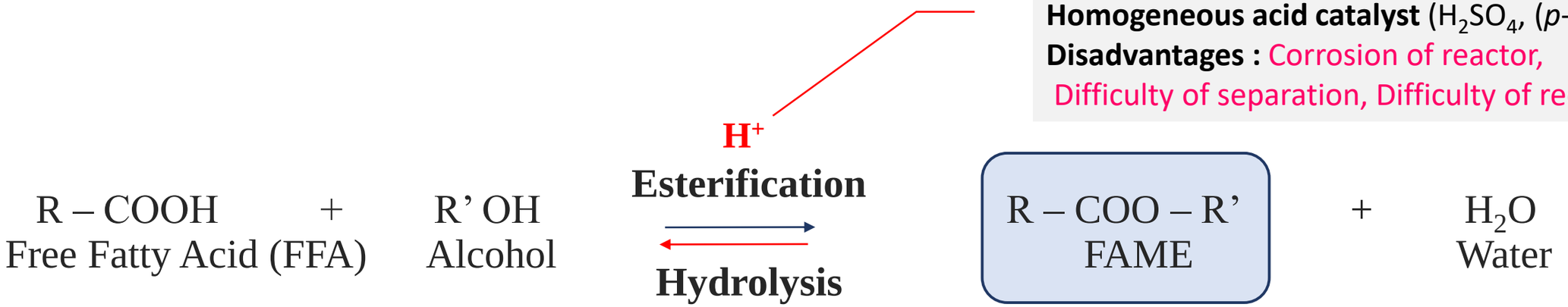
Presented by

Sakdinun Nuntang, Ph.D.

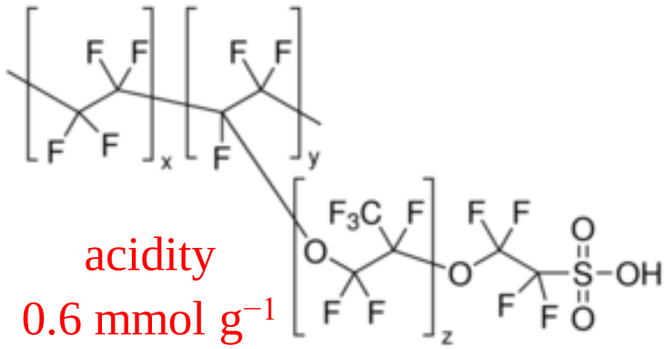
Contents

Synthesis of Fatty Acid Methyl Ester (FAME)

Homogeneous acid catalyst (H_2SO_4, (*p*-TsOH)
Disadvantages : Corrosion of reactor,
Difficulty of separation, Difficulty of recovery etc.

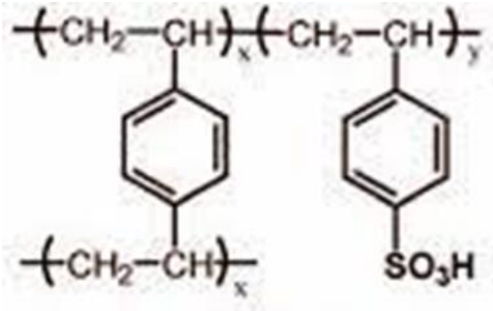


Commercial Heterogeneous Acid Catalyst



acidity
0.6 mmol g^{-1}

SAC 13

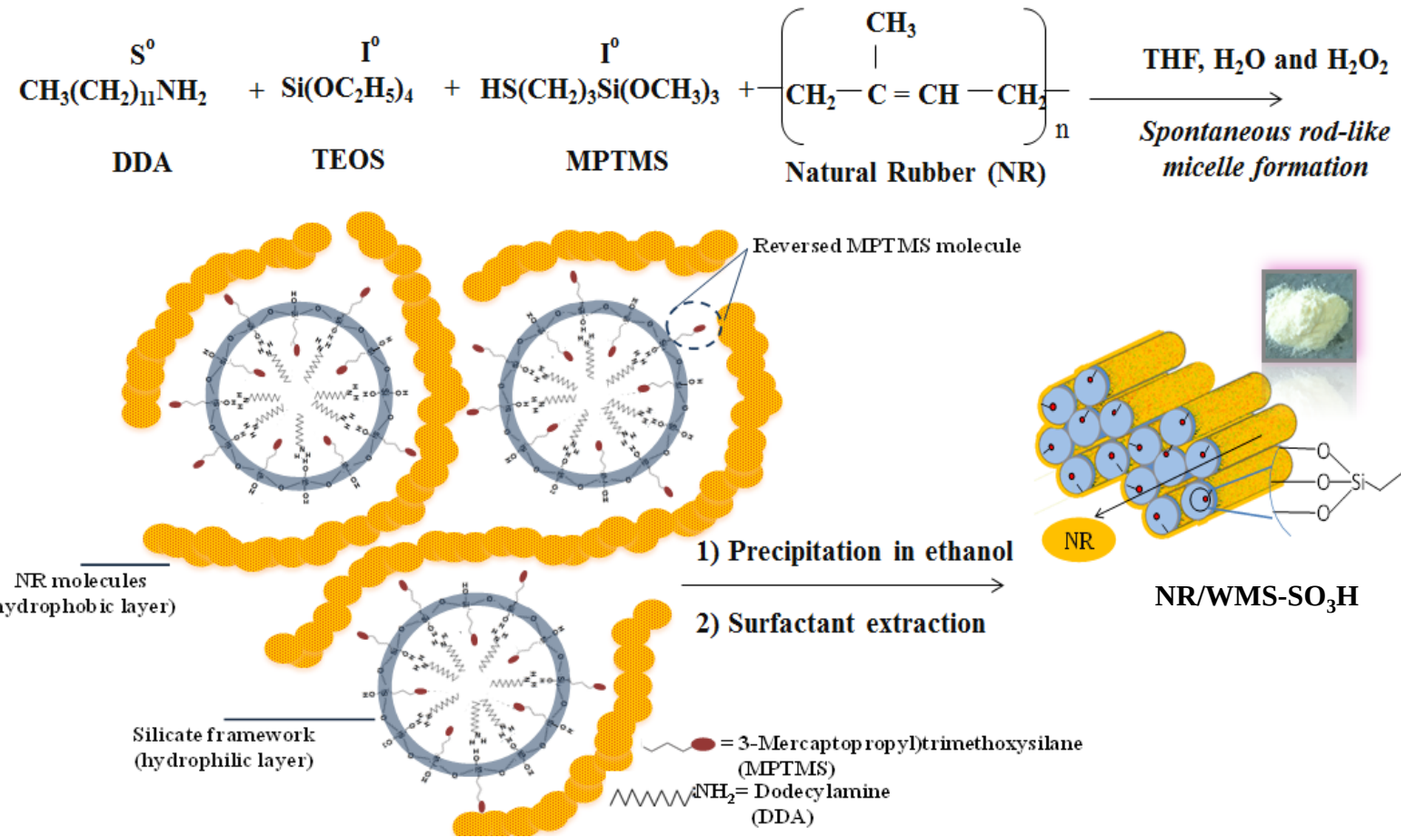


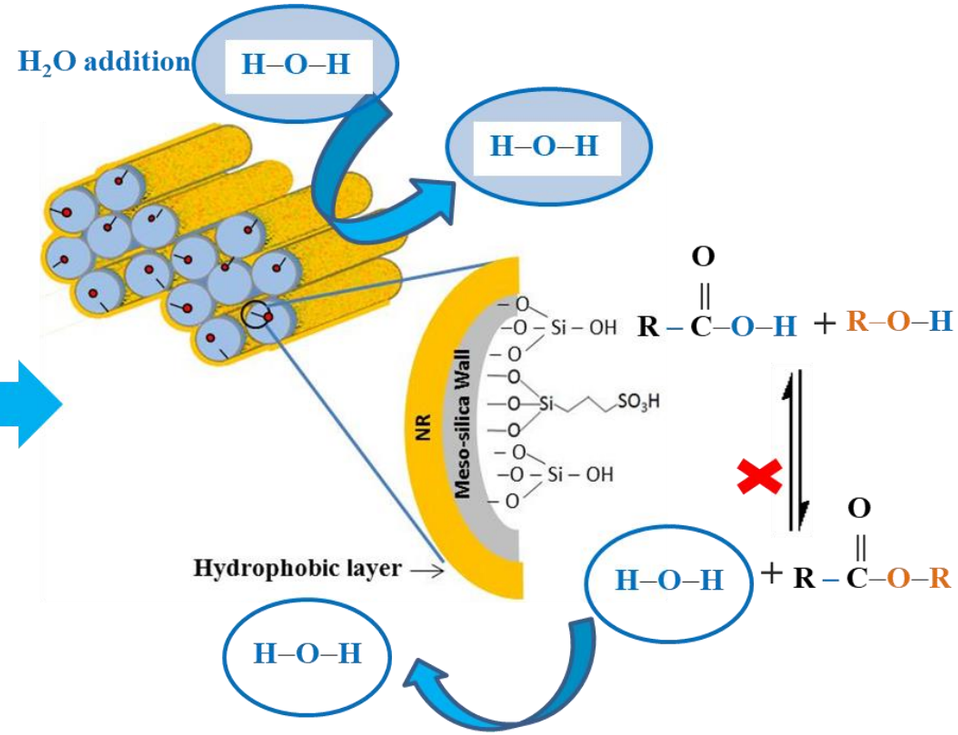
Amberlyst 15

acidity
4.4 mmol g^{-1}

Advantages : High acidity with sulfonic acid gr., Hydrophobicity and Reusability etc.

NR/WMS-SO_3H nanocomposite

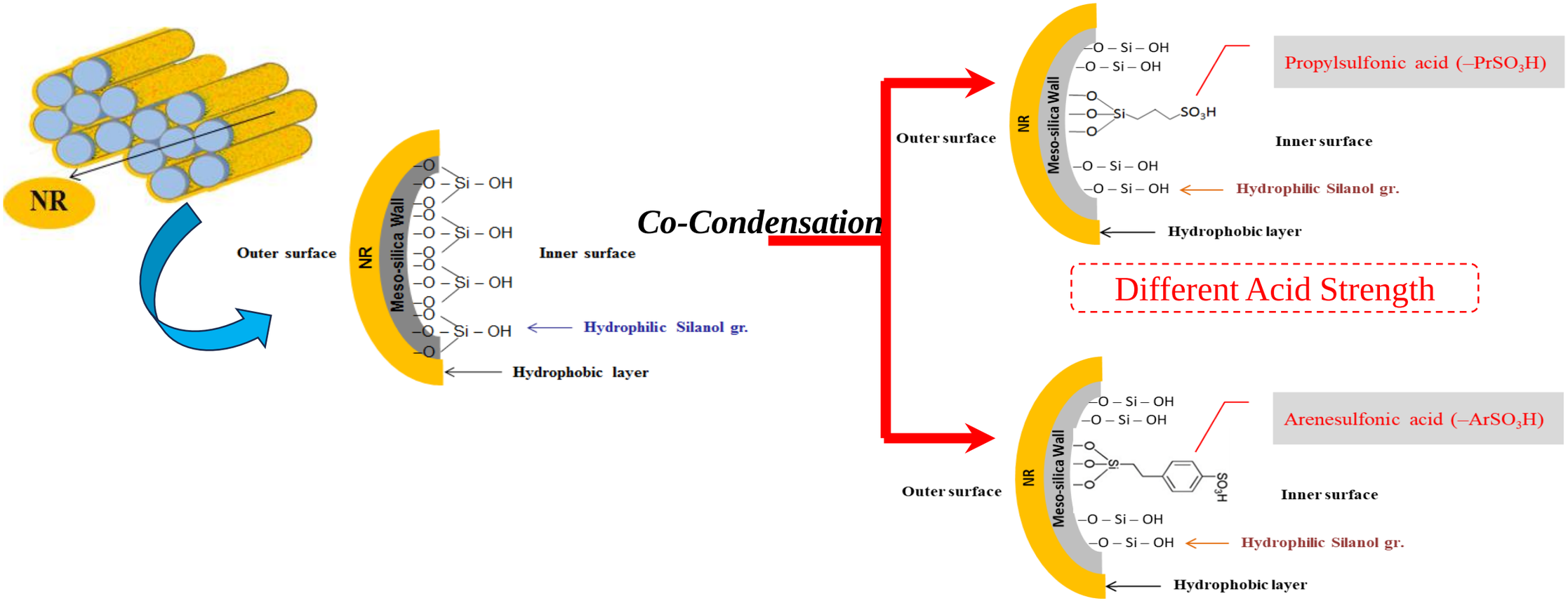




Pathway for formation of NR/WMS-SO_3H composite

Esterification of FFA and alcohol using NR/WMS-SO_3H as acid catalyst

Surface modification of NR/WMS-SO_3H nanocomposite



The objective of this study is to prepare a natural rubber/wormhole-like mesostructured silica nanocomposite functionalized by different sulfonic acid groups via the co-condensation method. The NR/WMS–SO_3H catalysts will be examined for their catalytic activity to produce FAME for biodiesel production.

Experimental : Preparation WMS-SO_3H

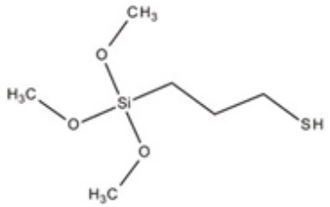
TDA + THF

*Tetraethoxysilane (TEOS)
*Tetradecylamine (TDA)
*Tetrahydrofuran (THF)

↓

Drop H_2O and TEOS

(stirring 40 °C, 30 mir



↓

Drop MPTMS and H_2O_2

*3-mercaptopropyltrimethoxysilane (MPTMS)

(stirring 40 °C,1 h.)

↓

Aging 18 h

↓

Filtration and dry @60 °C, 24 h

↓

Refluxed
NR/HMS (as synthesis) with 0.05 H_2SO_4 /EtOH 70 °C, 4 h

↓

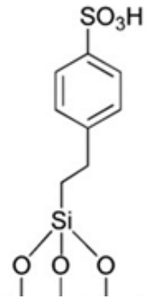
WMS-Pr-SO_3H

TDA + THF

↓

Drop H_2O and TEOS

(stirring 40 °C, 30 min.)



↓

Drop CSPTMS

*2-(4-Chlorosulfonylphenyl) ethyltrimethoxysilane (CSPTMS)

(stirring 35 °C, 20 h

↓

Aging 95 °C, 24 h

↓

Filtration and dry @60 °C, 24 h

↓

Refluxed
NR/HMS (as synthesis) with 0.05 H_2SO_4 /EtOH 70 °C, 4 h

↓

WMS-Ar-SO_3H

Experimental : Preparation NR/WMS-SO_3H nanocomposite

NR 0.5 g + TEOS 10 g

*Natural Rubber

(swelling 16 h.)

Swollen NR

Adding THF

(stirring 24 h.)

Drop TDA, TEOS and H_2O

Drop MPTMS and H_2O_2

(stirring 40 °C,1 h.)

Aging 40 °C, 3 d

Precipitation in EtOH

(filtration and dry 100 °C, 30 min.)

Refluxed

NR/HMS (as synthesis) with 0.05 H_2SO_4 /EtOH 70 °C, 4 h

NR/WMS-Pr-SO_3H

NR 0.5 g + TEOS 10 g

(swelling 16 h.)

Swollen NR

Adding THF

(stirring 24 h.)

Drop TDA, TEOS and H_2O

(stirring 1 h.)

Drop CSPTMS

(stirring 35 °C, 20 h.)

Aging 95 °C, 24 h

Precipitation in EtOH

(filtration and dry 100 °C, 30 min.)

Refluxed

NR/HMS (as synthesis) with 0.05 H_2SO_4 /EtOH 70 °C, 4 h

NR/WMS-Ar-SO_3H

Experimental : Esterification study

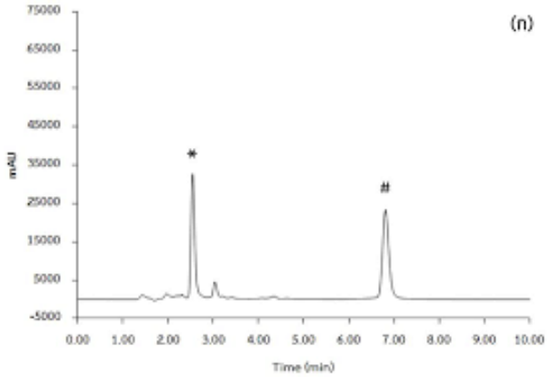
Gas chromatography = analyzed productivity

$$\%\text{conversion} = \frac{mole\ of\ carboxylic\ initial\ \ -mole\ of\ carboxylic\ remain}{mole\ of\ carboxylic\ initial} \text{x}100$$

120 °c

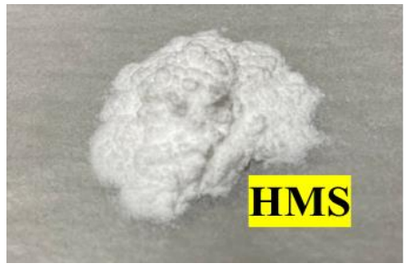
Palmitic acid + methanol + Catalyst

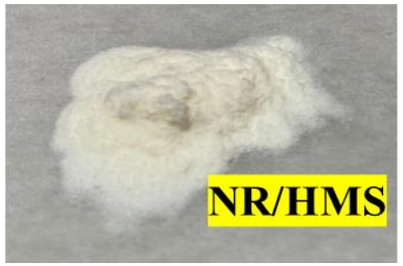
Sampling

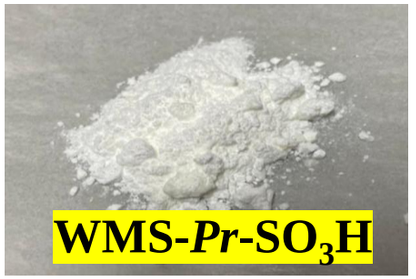


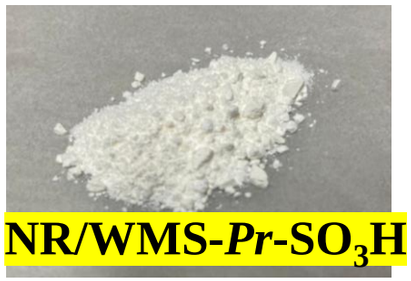
Condition: 120 ºC, molar ratio of palmitic acid: methanol at 1:20 , 3% wt. of catalyst loading and reaction time at 3 h.

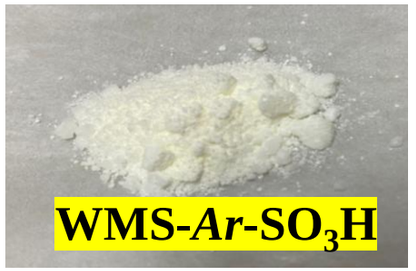
Results & Discussion

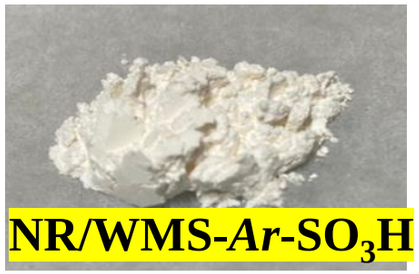












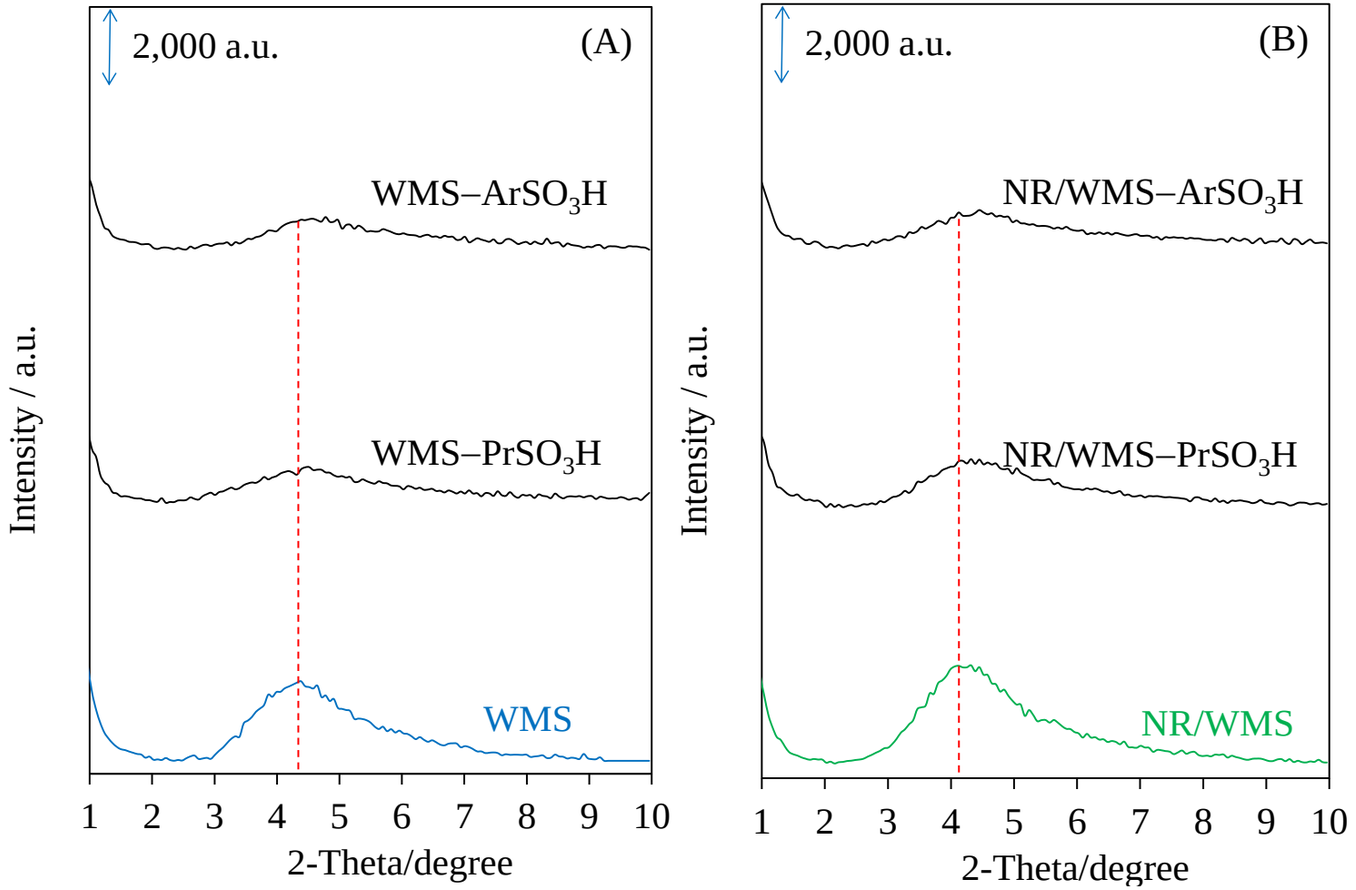


Fig. 1. XRD patterns of (A) WMS, WMS–SO_3H and (B) NR/WMS, NR/WMS–SO_3H composites

Results & Discussion

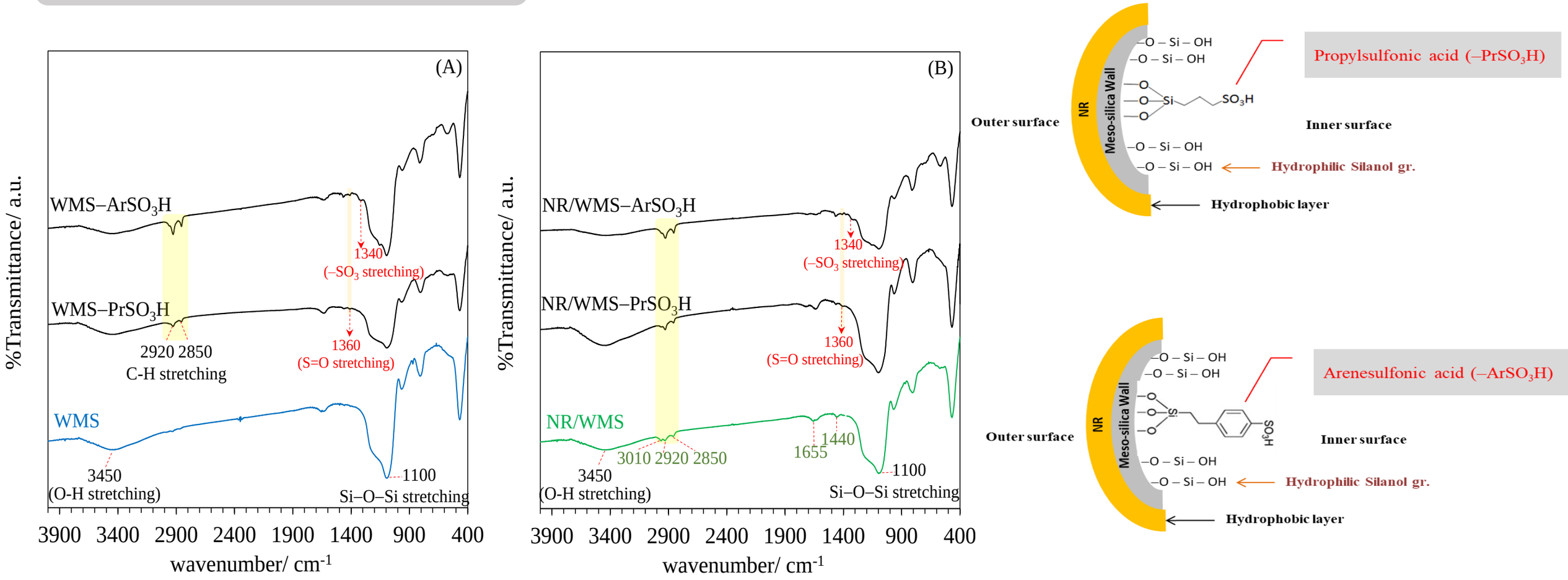


Fig. 2. FTIR spectra of (A) WMS, WMS–SO_3H and (B) NR/WMS, NR/WMS–SO_3H composites.

Results & Discussion

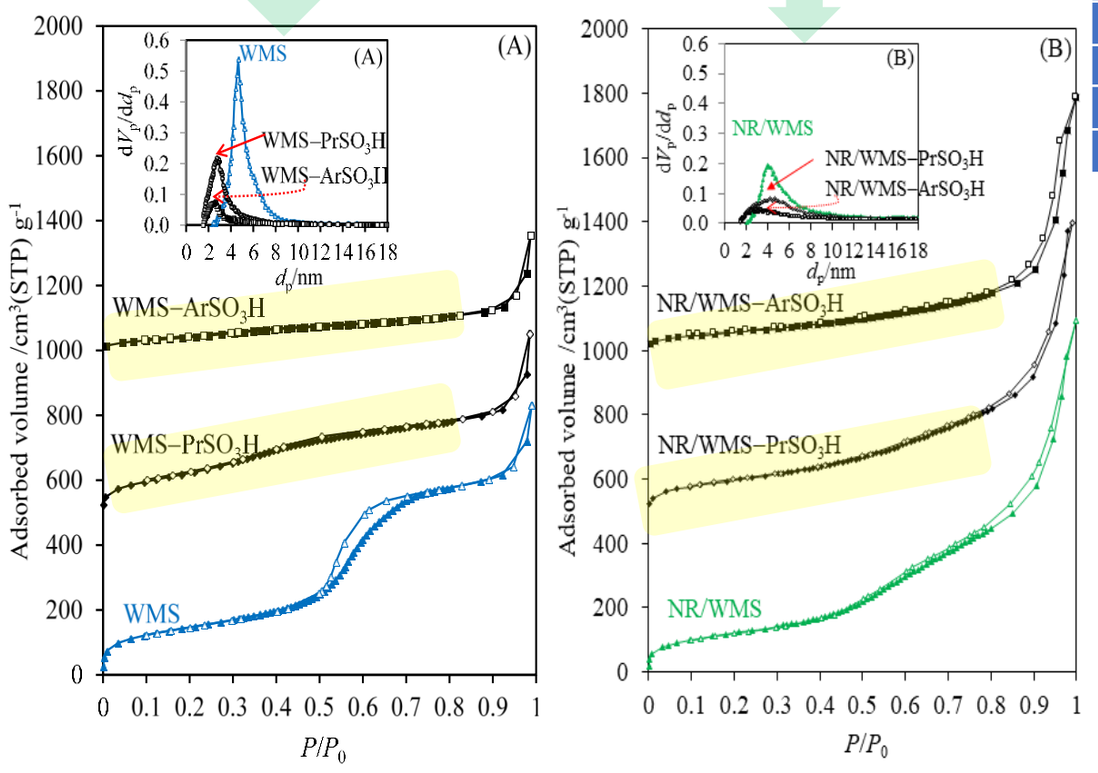


Fig. 3. N_2 adsorption-desorption isotherms and BJH pore size distribution of the (A) WMS, WMS–SO_3H and (B) NR/WMS, NR/WMS–SO_3H composites.

Table 1 Physicochemical properties of WMS, WMS–SO_3H, NR/WMS and NR/WMS–SO_3H

Sample[a]	S_{BET}[b] ($m^2\ g^{-1}$)	D_p[c] (nm)	V_t[d] ($cm^3\ g^{-1}$)	Acidity[e] (mmol $H^+\ g^{-1}$)	S content[f] (wt.%)
WMS	529.7	4.66	1.28	n.d.	n.d.
WMS-$PrSO_3H$	534.2	2.71	0.85	1.35	2.38
WMS-$ArSO_3H$	179.3	2.65	0.55	1.78	3.62
NR/WMS	465.8	4.22	1.69	n.d.	n.d.
NR/WMS-$PrSO_3H$	374.1	2.53	1.34	1.18	2.54
NR/WMS-$ArSO_3H$	222.6	2.46	1.20	1.61	4.42

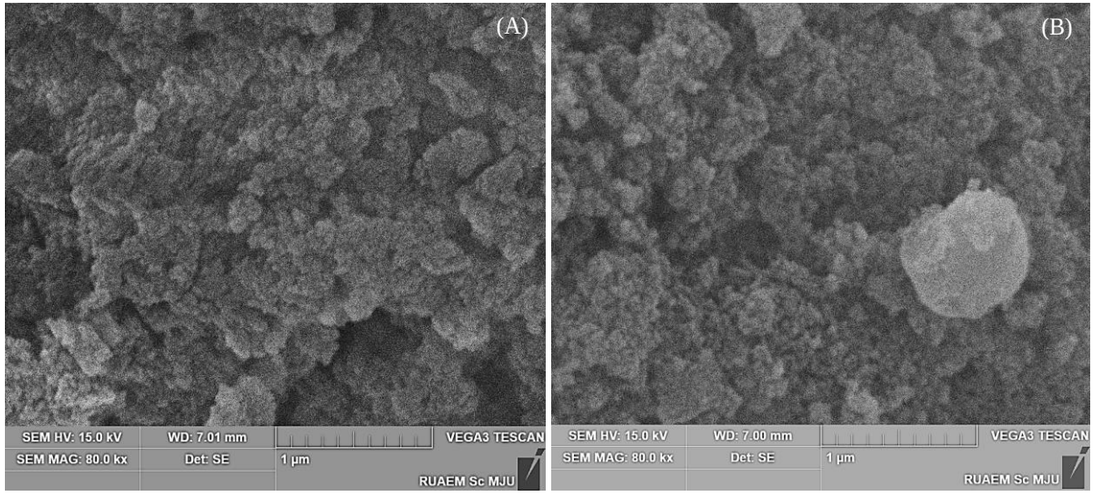
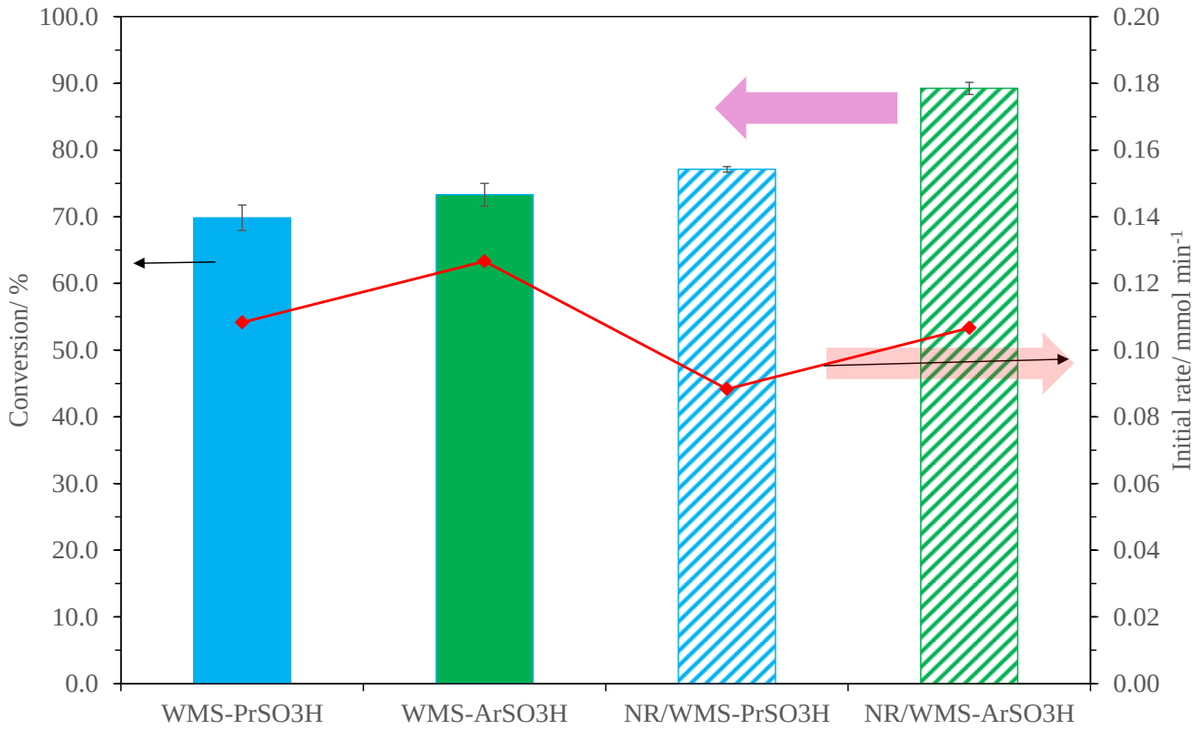


Fig. 4. SEM images (80,000 x magnification) of the (A) NR/WMS–$PrSO_3H$ and (B) NR/WMS –$ArSO_3H$ composites.

Results & Discussion



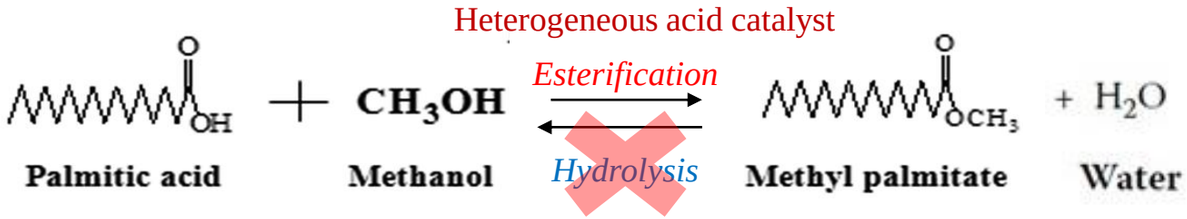


Fig. 5. Esterification of palmitic acid with methanol over WMS–SO_3H materials and NR/WMS–SO_3H composites.

Conclusions

- Physical characterization techniques indicated that organosulfonic acids affected the structural characteristics of the parent mesoporous silica materials manifested by decreasing the order of mesostructured, BET surface area and changes in pore size distribution.

- The $-ArSO_3H$ functionalized mesoporous silica materials exhibited a higher acidity and acid strength than the $-PrSO_3H$ group.

- The NR/WMS$-ArSO_3H$ with hydrophobicity and high acidity showed the highest conversion of palmitic acid at 89.3%.

- Therefore, the NR/WMS$-ArSO_3H$ catalyst was a potential solid acid catalyst for biodiesel production.

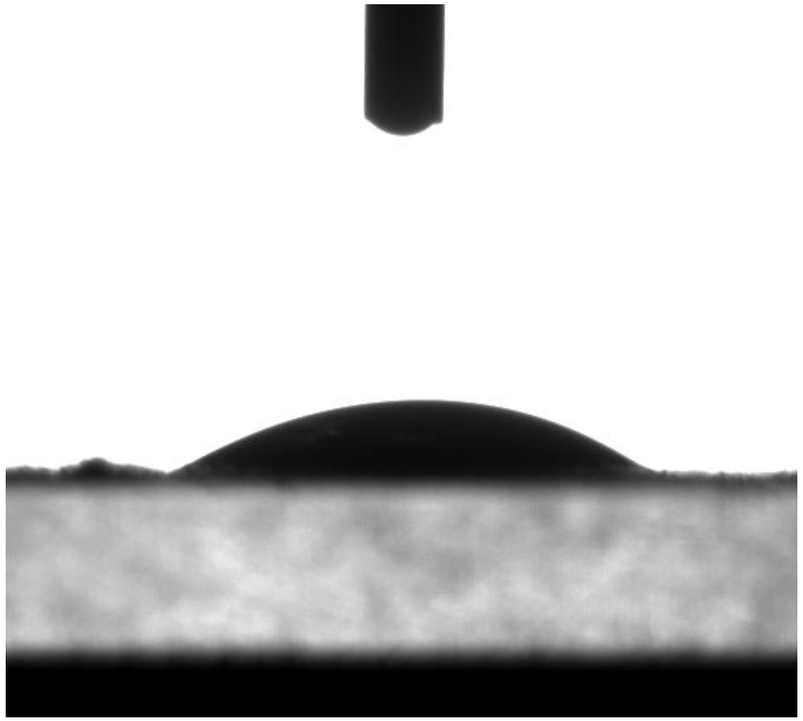
ACKNOWLEDGEMENT

Department of Industrial Chemistry and Innovation, Faculty of Science, Maejo University, Chiang Mai

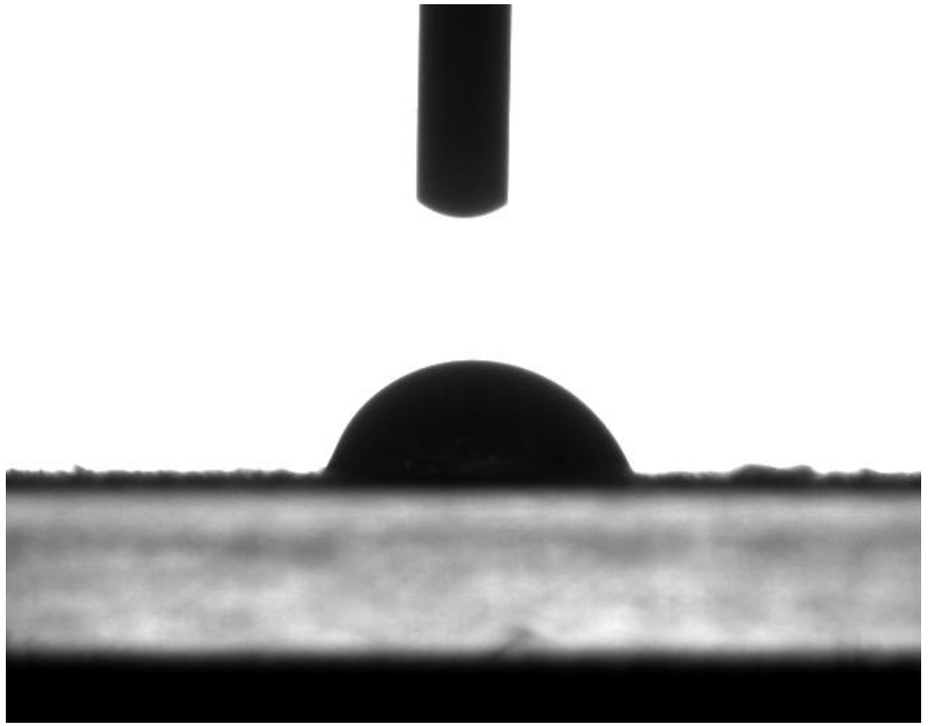
Thailand Science Research and Innovation

Thank You !
for your attention

Supplementary Information

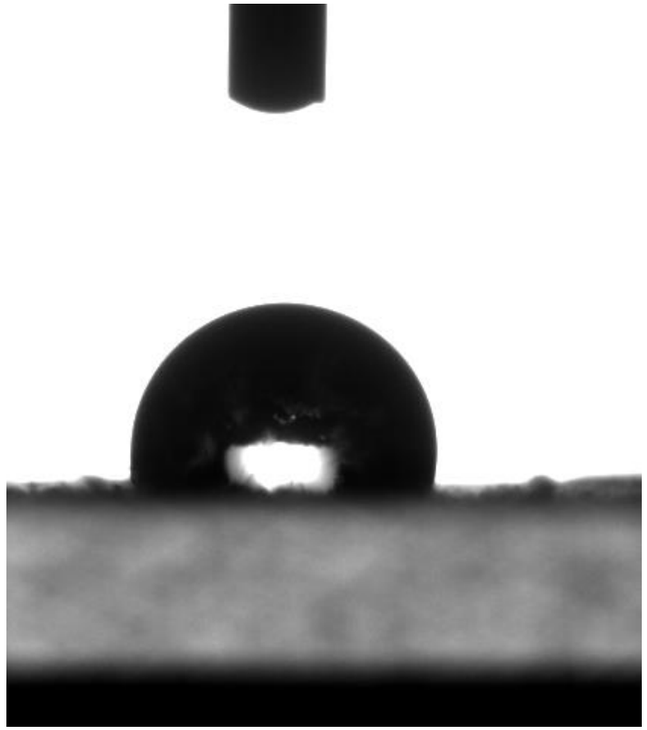


HMS		
Contact angle =	19°	
Averaging from 5 droplet data at 5 sec.		

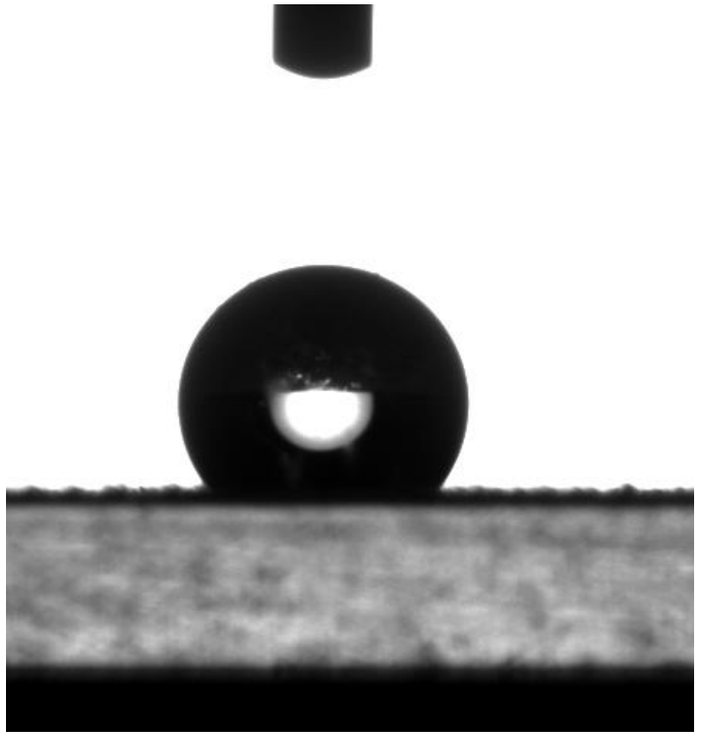


NR/HMS		
Contact angle =	80.8°	
Averaging from 5 droplet data at 5 sec.		

Supplementary Information

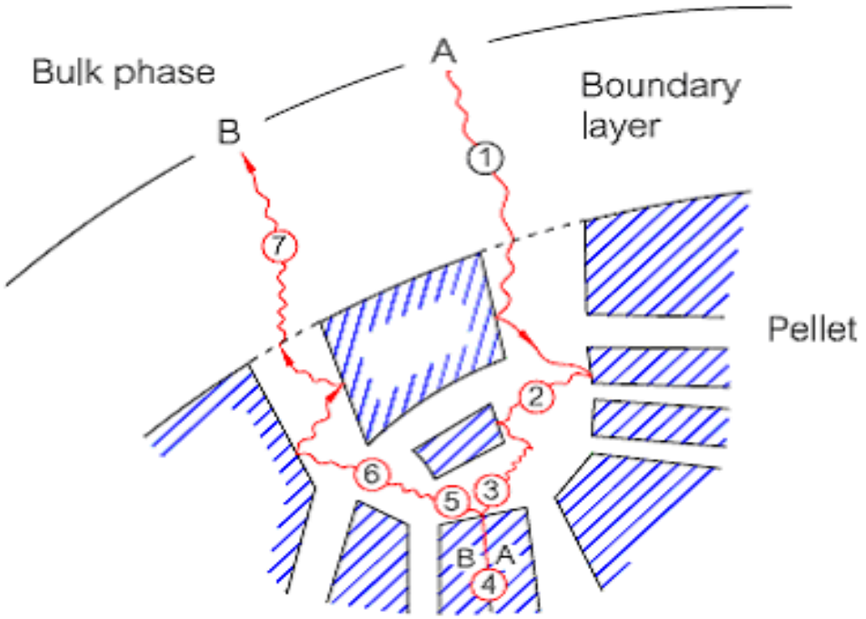


HMS-SO_3H		
Contact angle =	106°	
Averaging from 5 droplet data at 5 sec.		



NR/HMS-SO_3H		
Contact angle =	128.5°	
Averaging from 5 droplet data at 5 sec.		

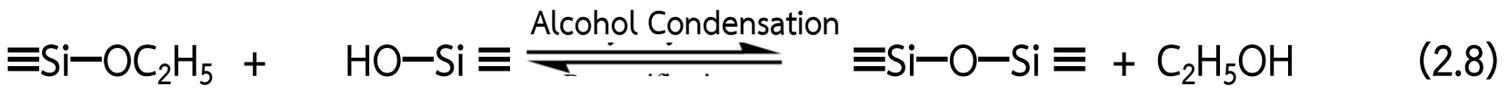
Supplementary Information



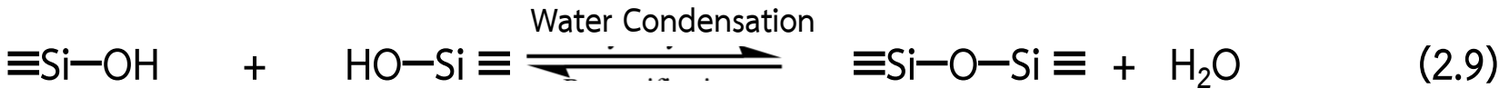
Steps in heterogenous catalysis

Supplementary Information

(2.7)

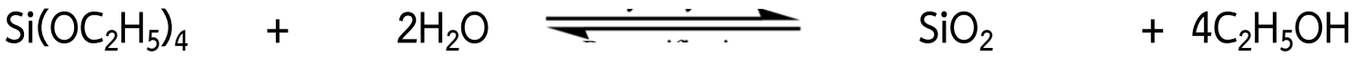


(2.8)



(2.9)

Overall reaction

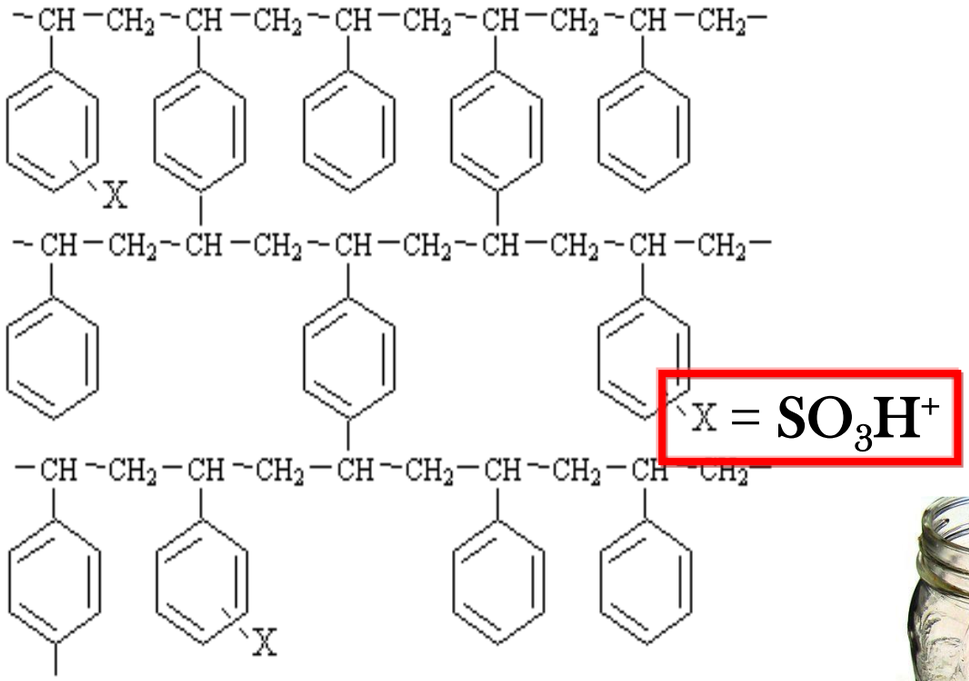


Hydrolysis and condensation of TEOS to form silica.

Supplementary Information

Amberlyst®

- High acidity
- Hydrophobicity
- Long lifetime
- Reusability



$$\underset{\text{Acid}}{R-COOH} + \underset{\text{Alcohol}}{R'OH} \xrightleftharpoons{\text{Acid catalysts}} \underset{\text{Ester}}{R-COO-R'} + \underset{\text{Water}}{H_2O}$$