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SYNTHESIS AND CHARACTERIZATION OF MICROPOROUS ORGANIC POLYMERS FROM AROMATIC HYDROCARBONS WITH FRIEDEL-CRAFTS ALKYLATION FOR CO_2 STORAGE

Huong TONG-T.T.[1*]; Dzung HOANG-Q.[1], Tuan TRAN-N.[1], Hoanh TRINH-D.[3]
[1] Faculty of Petroleum and Energy, Hanoi University of Mining and Geology, 18 Pho Vien, 100000 Hanoi, Vietnam
[2] Institute of Chemistry and Material, Academy of Military Science and Technology, 17 Hoang Sam, 100000 Hanoi, Vietnam
* *Corresponding author: Huong TONG-T.T., E-mail address: tongthithanhhuong@humg.edu.vn*

INTRODUCTION

- In recent decades, atmospheric CO_2 from human activity, particularly due to the combustion of fossil fuels, has attracted a lot of attention as a "greenhouse" gas and a factor in global warming.
- Microporous organic polymers (MOPs) are materials having pore diameters less than 2 nm on average that are composed of light, non-metallic elements such as C, H, O, N, and B. Microporous organic polymers are networks constructed from small organic building blocks. MOPs show the particular advantages of a variety of useful chemical functionality into the pores.
- The polymerization based on Friedel-Crafts alkylation is a successful method for creating a three-dimensional polymeric network with large surface areas

METHODS

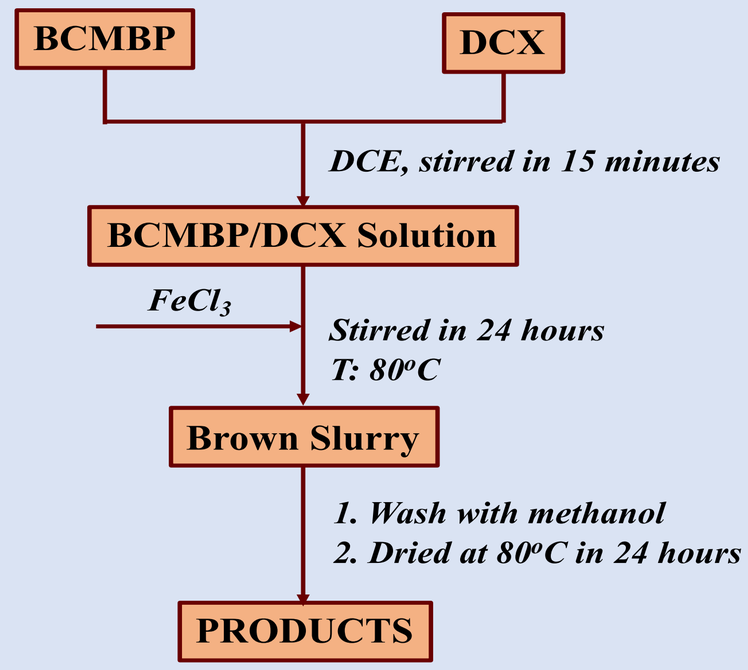
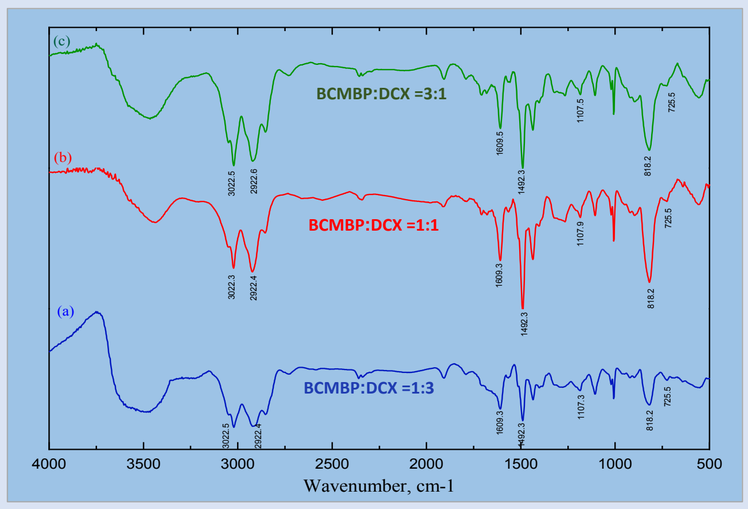


Diagram of MOPs synthesis from BCMBP and DCX

RESULTS

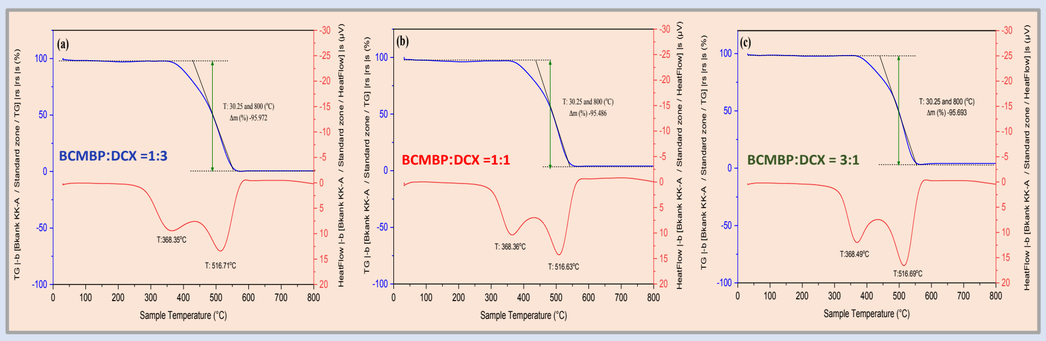
FT-IR of MOPs synthesized from BCMBP and DCX

There was indeed a copolymerization.
Theunsaturated C = C vibration at 1609 cm^{-1}, 1492 cm^{-1},
The vibration of 1,4-substitution at 818 cm^{-1}, that meaning the containing **of para-subtitution compound based on BCMBP and DCX**.
The intensity of the characteristic bands at 1107 cm^{-1} and 725 cm^{-1} for functional groups of BCMBP and DCX



To confirms the creation of crosslinking between monomers to form organic polymers.

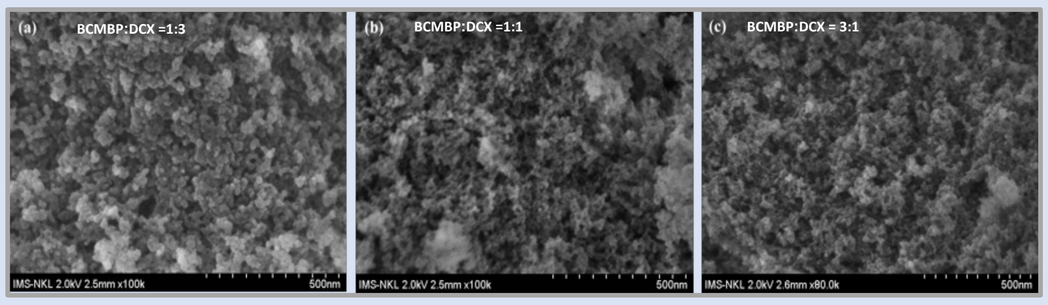
SEMs of MOPs synthesized from BCMBP and DCX



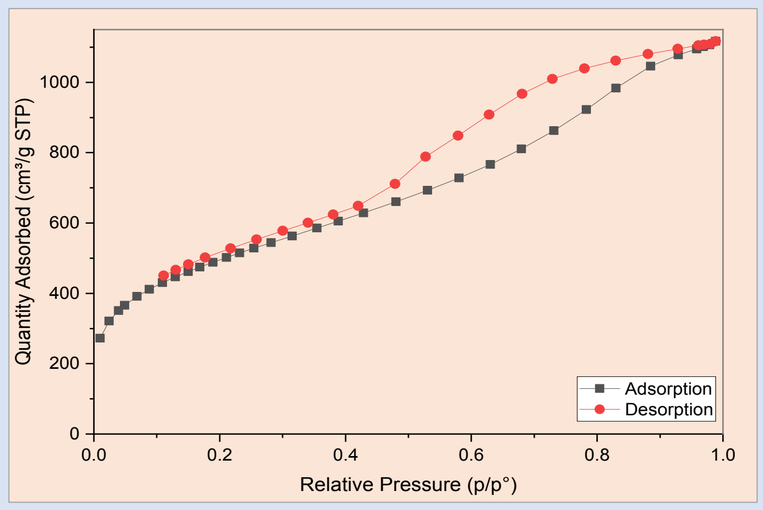
- All samples are thermally stable up to a temperature of 368 °C in air
- Samples are completely destroyed at 517 °C. Due to weaker stability of methylene linkers compared with aromatic rings, these samples begin to degrade at about 368 °C.

SEMs of MOPs synthesized from BCMBP and DCX

- All samples consist of spheres
- Sample with a BCMBP/DCX ratio of 1:3 shows particles with larger dimensions than the other.
- The regular uniform particles



BET Surface area and pore size distribution of MOPs synthesized from BCMBP and DCX



- The BET surface area (S_{BET}) is ranged from 1476.36 m^2/g to 1663.36 m^2/g
- The pore size distribution centered around 54 Å estimated by nonlocal density functional theory confirms the porosity of the synthesized polymeric network
- The ratio of BCMBP and DCX is lightly affect to the products. DCX content changed the polymer crosslinking levels.

CONCLUSIONS

- Microporous polymer was synthesized from 4,4-Bis-(chlorometyl)-1,1-Biphenyl (BCMBP) and Dichloro-p-xylene (DCX) using a Friedel-Crafts alkylation process promoted by anhydrous $FeCl_3$.
- These samples remained **stable up to 300°C – 350 °C in air**. **The BET** specific surface areas **were high from 1476.36 m^2/g to 1663.34 m^2/g** and pore width average from 60.7 – 52.5 Å. The advantage conditions for the synthesis are temperature of 80 °C, and time duration of 24 hs.
- The synthesized polymer promising candidates for potential application for adsorption such as **capture of CO_2 or gas separation**.

Acknowledgments

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