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SYNTHESIS OF ZEOLITE TEMPLATED GRAPHENE (ZTG) FROM METHANOL VIA CHEMICAL VAPOR DEPOSITION (CVD) METHOD

MOHD SYAFIQ BIN ELIAS

(MS112098)

ASSOC. PROF. DR. NOR AZIAH BUANG

DEPERTMENT OF CHEMISTRY
FACULTY OF SCIENCE
UNIVERSITI TEKNOLOGI MALAYSIA

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For my respectful supervisor, my beloved mother and father, my siblings andmy best friend forever

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ABSTRACT

A new synthesis route in the production of graphene by template synthesis technique using zeolite as the host materials has successfully produced graphene. The highly regular ordered and highly crystalline structure of zeolite was successfully utilized for the formation of ordered sp^2 graphitized graphene structure in the zeolite porous framework. Graphitic carbon structure of zeolite template graphene (ZTG) has been synthesized via catalytic chemical vapor deposition (CVD) method from methanol as the carbon precursor. The influence factors of types of zeolite used in the template synthesis and CVD reaction temperatures have been investigated to obtain the optimum experimental condition for producing high quality of ZTG. The results show acid sites of the zeolite plays an important role in the synthesis of ZTG in porous framework of zeolite structure. CVD reaction temperatures at 500°C is considered as the best reaction temperature for the production of graphene using zeolite as template with high quality of carbon graphitic structure. UV- Visible spectroscopy and Raman spectroscopy analysis further proven the existence of sp^2 character of graphene structure with small amount of defect in the ZTG produced.

ABSTRAK

Kaedahsintesisbaruuntukmenghasilkangrafindengantekniksintesisacuanmenggunakan zeolite sebagaibahanacuantelahberjayamenghasilkangrafinberkualititinggidenganjumlahkuantiti yang mencukupi.Struktur yang sangattersusundanstrukturhablur zeolite telahberjayadigunakanuntukmembentukstruktur sp^2karbongrafin yang tersusun di dalamstrukturbingkaianberliang zeolite. Strukturkarbongrafinacuan zeolite (ZTG) telahdisintesisdengankaedahpemendapanwapkimia (CVD) daripada methanol sebagaisumberkarbon.Faktorpengaruhjenis zeolite yang digunakandalamtekniksintesisacuandansuhutindakbalas CVD telahdikajiuntukmendapatkankeadaaneksperimen yang optimum untukmenghasilkan ZTG yang berkualititinggi.Keputusaneksperimenmenunjukkanbahagianasid zeolite memainkanperananpentingdalamsintesis ZTG di dalamstrukturbingkaianberliang zeolite.Suhutindakbalas CVD pada 500°C dianggapsebagaisuhutindakbalas yang terbaikuntukmenghasilkangrafinmenggunakan zeolite sebagaibahanacuandenganstrukturkarbon yang berkualititinggi.Analisis UV spektroskopidan Raman spektroskopimembuktikanlagikewujudankriteriasp^2strukturgrafindengansedikitkecacatandalam ZTG yang dihasilkan.