Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	NANOSTRUCTURED MATERIALS
COURSE CODE	:	BWC 30903
PROGRAMME CODE	:	BWC
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Electrical and mechanical devices, components and systems are being manufactured in a variety of sizes from macro to nano. Compare the properties of macro, micro and nano particles.

(9 marks)

(b) (i) Describe the induced effects due to the increase in surface area of nanoparticles?

(7 marks)

(ii) Explain briefly in geometric terms what you understand by a "quantum wire".

(4 marks)

Q2 (a) Define bulk nanostructured materials.

(3 marks)

(b) Briefly explain a synthesis method to form bulk structural nanocrystalline materials

(8 marks)

(c) Explain the mechanism of hard nanostructured coatings in improving the structural properties of the material.

(9 marks)

Q3 (a) Elaborate the process to fabricate nanostructures using the photolithography or electron beam lithography (EBL) technique.

(8 marks)

(b) Describe the limitations in today's photolithography when it comes to decreasing the feature size.

(4 marks)

(c) Outline the advantages and the disadvantages of EBL versus photolithography.

(8 marks)

Q4 (a) Illustrate and explain the properties that are required to obtain a superhydrophobic surface.

(9 marks)

(b) List out the potential application that can utilize the superhydrophobic surfaces.

(6 marks)

(c) Discuss the uniqueness of carbon in nanoscience perspective.

(5 marks)

Q5 (a) Describe the working principle of Fourier transform infrared spectroscopy (FTIR) machine.

(6 marks)

(b) Outline the advantages and the disadvantages of FTIR.

(6 marks)

(c) **Figure 5(c)(i)** shows an example of the FTIR spectrum of reduced graphene oxide (rGO) and graphene oxide (GO) while **Figure 5 (c)(ii)** shows the structure of graphene oxide. Explain the data that can be discussed from the FTIR spectrum.

(8 marks)

– **END OF QUESTIONS** –

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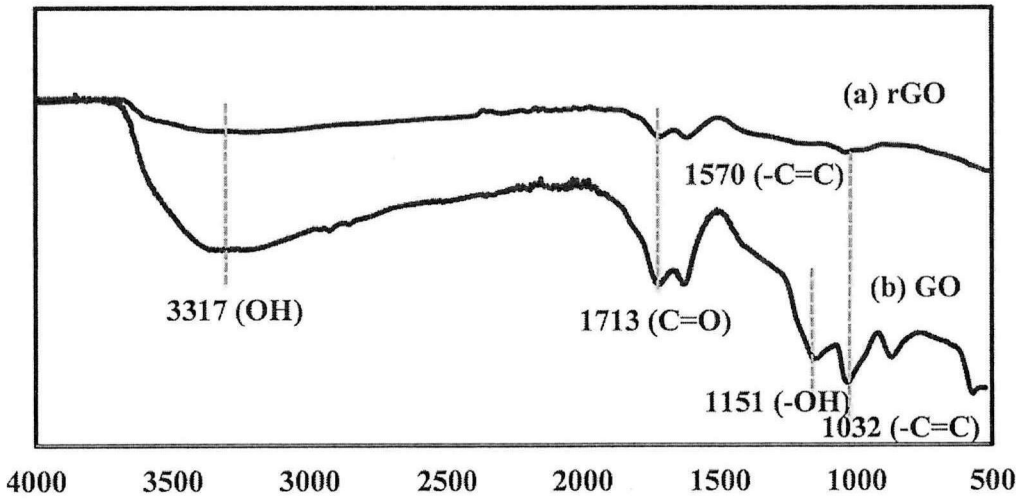

Figure Q5 (c)(i)

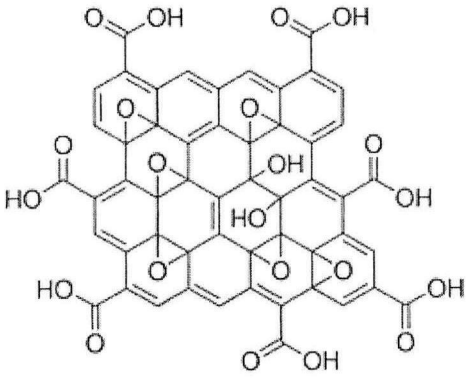

Figure Q5 (c)(ii)