The Effect of Carbon Nanofiber Addition on the Structure of Carbon Foam

Aysenur Gul[a]*, Ekrem Ekinci[b], M. Ferhat Yardım[c]

[a]Material Science and Engineering,Istanbul Technical University,Maslak 34469 Istanbul, Turkey
[b]Faculty of Engineering, Işık University, Şile 34980, Istanbul, Turkey
[c]Chemical Engineering Department, Istanbul Technical University, Maslak 34469 Istanbul, Turkey
*gulay@itu.edu.tr

Carbon foam has unique properties which can be listed as adjustable thermal conductivity, low coefficient of thermal expansion, high specific surface area, low moisture absorption, high corrosion resistance, tailorable electrical properties, excellent acoustic absorption and electromagnetic shielding and ultra lightweight structure[1].

In the present study, the effects of various weight fractions of herringbone type carbon nanofiber (HCNF) on the structure of carbon foam were examined. Carbon nanofiber was synthesized from ethylene over an iron/nickel/magnesium alloy catalyst. AR mesophase pitch provided by the Mitsubishi chemical company with a softening point of 275-295 ^{o}C. Mesophase pitch was mixed with weight fractions of 0 %, 5 %, 10 %, 20 % HCNF and then pounded by mortar. Pitch-fiber mix was placed in a reactor. First, air in the system was purged out with nitrogen. Later, nitrogen was vacuumed and pressure was applied. After that, the samples were heated to about 50-100 ^{o}C above its softening point and next the system was set at this temperature for 2 hours, then heating continued until 600^{o}C and was held for 30 min. Finally pressure was released rapidly and sample was cooled down to ambient temperature in order to obtain green carbon foam samples. The green foams were carbonized by heating up to 1100 ºC under nitrogen.

Addition of carbon nanofiber into mesophase pitch decreased the product quality in terms of pore formation and volume (Figure 1). Also, the 002 peak x-ray diffraction (indicator of ordered structure) tended to disappearing with the presence of nanofiber (Figure 2).

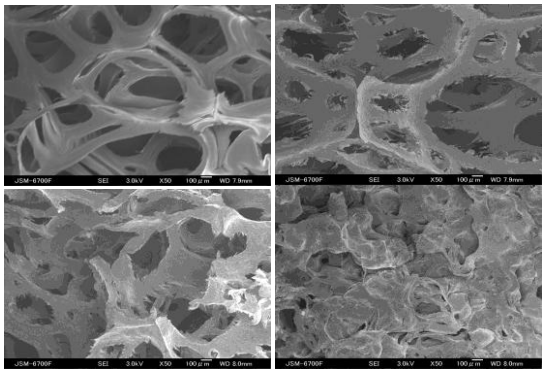

Figure1. Cell morphologies of carbon foam with 0, 0.05, 0.1, 0.2 fiber fractions

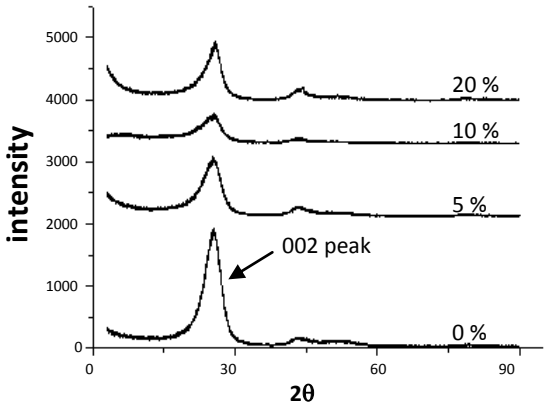

Figure2. X-ray images of samples

References

[1] M, Sipahi, EA Parlak, A. Gul, E. Ekinci, F.M. Yardim, A.S.Sarac, Progress in Organic Coatings, 62(1), 96-104,2008

Acknowledgement

These experiments were carried out in Kyushu University Laboratories. The present authors acknowledge Prof. Mochida and Prof. Yoon for realizing this work