Development of advanced carbon materials from carbonized Japanese cedar

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The task of our laboratory is to establish the society with proper resource recycle system in the future humanosphere. Fundamental and innovative investigations are being conducted with emphasis on the symbiotic relations with forest and wood resources. Prof. Yuji Imamura, Dr. Kunio Tsunoda, Dr. Tshuyoshi Yoshimura, myself and other members of the Lab. are dedicating their constant efforts to achieve the goal. Here, one of the topics of our laboratory, development of advanced carbon materials from carbonized Japanese cedar is presented.

Japanese cedar, i.e.Sugi (*Cryptomeria japonica*), was at first carbonized in an electric furnace at 700 ºC under Ar flow, at 4 ºC/min heating rate, for one hour. The resulting charcoal was milled and then soaked in a 40 % isopropyl alcohol solution of Al-triisopropoxide. After drying, the specimen was carbonized in a pulse current sintering apparatus up to 1300 ºC for 5 min [1]. Without catalyst and after "classical" carbonization, such carbonized-wood consists in a non-graphitizing carbon with a highly porous texture. In the experiment, due to catalyst addition, the intermediate reaction of Al_2O_3 with carbon leads to the formation plate-like Al_4C_3. Then this latter compound dissociates under the proper CO pressure and temperature, leading to the formation of Al vapor and well-ordered graphitizing carbon at low temperature. The modification of the texture, microtexture and structure of such carbonized samples was followed by scanning and transmission electron microscopies.

Subsequently, on this carbonized then sintered samples, we demonstrated that growth of catalytic multiwall carbon nanotubes was possible. Experiments were performed at 650 ºC under N_2/H_2 then N_2/C_2H_4 atmospheres. Multiwall carbon nanotubes with a diameter of about 50 nm were produced (Fig.1). Possible applications could be in the field of electrochemistry.

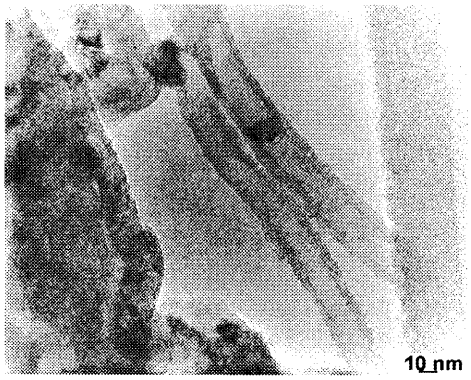

Fig. 1. Growth of Multiwall carbon nanotubes at the surface of wood, successively carbonized, impregnated with an Al-based solution, sintered and used as support for catalytic decomposition of acetylene [2].

REFERENCES

[1] Hata, T. et al (2002) Molecular Crystals and Liquid Crystals vol.386 : 33-38

[2] Hata, T. et al (2005) The 1st International Conference on Carbon for Energy Storage and Environment Protection, Orleans, France, October 2-6

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