Abstract of Presentation

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Presentation Title(Should be no more than 20 words):
Development of Advanced Carbon Materials from Carbonized Sugi (*Cryptomeria japonica*) Wood

Abstract :

The possibility of producing new carbon materials based on biomass resources and their applications as advanced carbon materials imply to be able to control their texture, microtexture, surface chemistry, and to propose experiments and processes emphasizing their characteristics. In this study, different examples of valorisation of such materials will be presented.

Sugi (*Cryptomeria japonica*) wood, was at first carbonized in an electric furnace at 700 ºC under N_2 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. Without catalyst and after "classical" carbonization, such carbonized-wood consists in a non-graphitizing carbon with a highly porous texture. In our 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 and will be presented.

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. Possible applications could be in the field of electron emitters. Another example concerns the formation of ceramic wood and the production of silicon carbide nanorods. In this case Japanese cedar was at first carbonized at 700°C under vacuum, then infiltrated with tetraethylorthosilicate (TEOS). In a second step, it was heated at 1500°C for 30 min using the same pulse current heating device. This man-made ceramic wood allow the use of such material at high temperature, because the one-micrometer thin SiC coating offers an efficient protection against oxidation.