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Growth Technique of Single-Walled Carbon Nanotube Production Technology Using Shochu as a Raw Material

Carbon nanotubes (CNTs), which have garnered significant attention as a novel material, have been produced through various proposed synthesis methods [1]. However, the industrial sector demands a simpler and more cost-effective approach for single-walled carbon nanotubes (SWNTs) production. In this study, carbon nanotubes were successfully synthesized using ethanol, a raw material derived from shochu made from Japanese sweet potatoes, via the alcohol catalytic chemical vapor deposition (ACCVD) method [2]. During the synthesis process, Ar gas was used as a carrier gas. Al (10 nm) and Ni (2 nm) were employed as catalysts. The synthesized SWNTs were grown on a Si wafer (100) substrate, where a tandem-structured thin film of iron and nickel was formed via vacuum deposition to function as a catalyst. As-grown SWNTs were analyzed using transmission electron microscopy (TEM), field-emission scanning electron microscopy (FE-SEM), Raman spectroscopy, and X-ray Photoelectron Spectroscopy (XPS) to obtain structural and electronic information. This study proposes a CNTs synthesis technique utilizing ethanol derived from shochu as a raw material, thereby demonstrating the feasibility of substituting industrial ethanol with plant-based ethanol.

Reference:

Ref. [1] S. Rathinavel, K. Priyadharshini, Dhananjaya Panda; Dhananjaya Panda; Materials Science and Engineering: B, Vol. 268, 2021, 115095.

Ref. [2] Husnu Emrah Unalan and Manish Chhowalla; 2005 Nanotechnology 16 2153DOI 10.1088/0957-4484/16/10/031.

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Applications

Author: Prof. 湯地, 敏史 (Univ. Miyazaki)

Co-authors: Dr OTA, Keishin (Microphase Ltd.); Mr KAMATA, Noritsugu (Tokyo Denki Univ.); Dr TASHIRO, Shinichi (Osaka Univ.); Dr POONTHONG, Wittawat (Univ. Miyazaki); Dr OYA, Yasuhisa (Shizuoka Univ.); SUZAKI, Yoshifumi (Kagawa University)

Presenter: Prof. 湯地, 敏史 (Univ. Miyazaki)

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