BIOFUELS & ENVIRONMENTAL CATALYSIS

PROJECT FACTS

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Catalysis using carbon nanotubes

Carbon materials represent an important class of catalyst supports and are employed as such in a number of industrial processes. Among the properties which make them attractive as supports are their high surface area, stability under reducing conditions and the degree to which their surface chemistry can be tailored to specific applications. Whilst activated forms of carbon have traditionally been used in catalysis, in recent years new forms of carbon such as carbon nanofibres and nanotubes have become available. Studies on the use of these materials in catalysis are still relatively sparse, although some reports suggest that in catalytic applications they can prove superior to traditional carbon supports.

In collaboration with the Carbon Materials group at CAER, we are exploring the use of carbon multi-walled nanotubes (MWNT) in catalysis. A key aim in this work is to exploit the adsorptive properties of MWNTs in tandem with a catalytic function. As a starting point, we are focusing on the controlled deposition of metals and metal oxides on MWNTs. In this context the oxides of catalytically active metals such as Mn and Cu are of particular interest. As shown in Figure 1, using an adsorption-hydrolysis method deposition of highly dispersed CuOx aggregates can be achieved.

In a related line of research, the deposition of organosilicon polymers onto MWNTs (Fig. 2) is being studied. Thermal treatment of the resulting materials leads to the formation of a novel composite support in the form of silica-coated carbon nanotubes. Additionally, organosilicon polymers can be used to chemically bind MWNTs together, as shown in Figure 3. MWNTs modified in this manner may impart interesting physical properties when incorporated in composite materials such as reinforced polymers.

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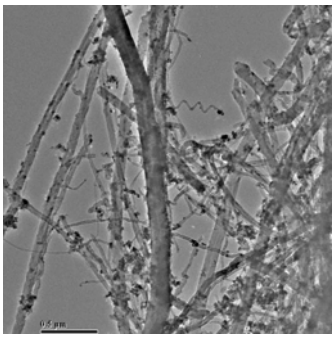

Fig. 1. CuOx on MWNTs

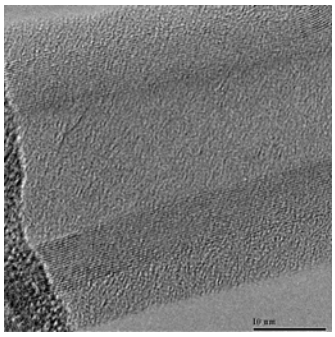

Fig. 2. Polymer-coated MWNT

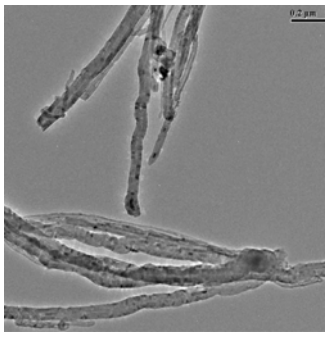

Fig 3. Bound MWNTs