

Preparation and morphologies of elastic carbon microcoils/nanocoils by various catalysts

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(Anstract) The preparation conditions and morphology of the CMC over Ni powder, Fe-base alloy, W and WS₂ powder catalyst was examined. Using Ni powder, by lower acetylene feed, the CMC have commonly double helix forms such as a DNA (deoxynucleic acid) and are relatively irregularly coiled with large coil gap of 0.2-1.0 μm, coil diameter 10~50 μm, and these CMC could be expanded up to almost straight form. Using WS₂, the outer diameter was several microns or several hundred nanometers, the coil pitch is about the same size with the coil diameter, and the coil length was 0.5 mm. Using Fe alloy catalysts, by carefully controlling the temperature and flow rates of the reaction gases, single-helix carbon nanocoils (CNC) with large ranges of coil diameter and coil pitch were obtained.

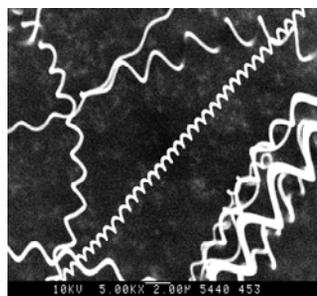


Fig. 7. Carbon coils with large coil pitches, Reaction temperature: 760C, by WS catalyst

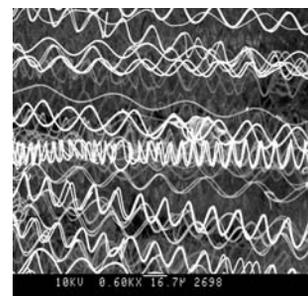


Fig. 9. Extension characteristics of carbon microcoils with big coil diameter.

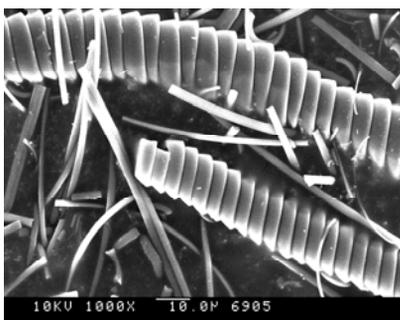


Fig.1. Regular carbon microcoils. Reaction temperature: 760° C, catalyst: Ni powder.



Fig. 2. Super-elastic irregular carbon coils with circular fiber cross-section and large coil diameter. Reaction temperature: 760° C, catalyst: Ni powder.



Fig. 8. Carbon microcoils with large coil diameter. Reaction temperature: 750° C, by WS₂ catalyst

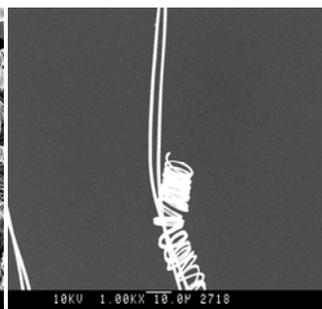


Fig. 10. Extension characteristics of carbon microcoils with big coil diameter. Recovery state after releasing the extension.

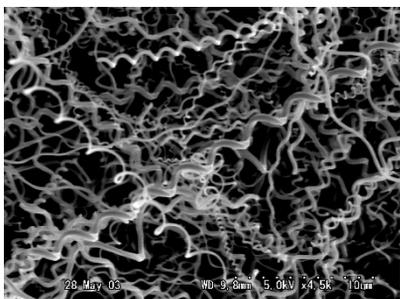


Fig. 3. Carbon coils with large coil pitches. Reaction temperature: 760C, catalyst: Fe54-Ni29-Co17.



Fig. 4. Regular single-helix carbon nanocoils. Catalyst: Fe-Cr- Ni.

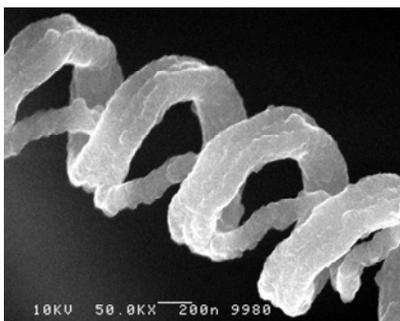


Fig. 5. An interesting carbon nanocoils. Catalyst: Fe-Cr- Ni, 1.5h

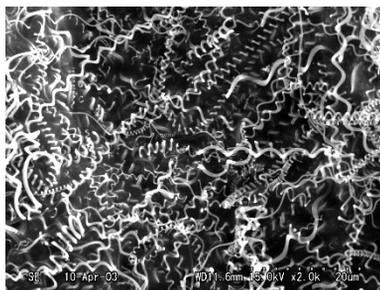


Fig. 6. Carbon coils with large coil pitches. Reaction temperature: 587° C, catalyst: Fe74-Cr26.