

Pyrocarbon Whisker Growth on the Catalytic Mullite Substrate by the Pyrolysis of Methane

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Like bamboo-sprouts after rains, numerous sub μm -sized pyrocarbon whisker growth on the Mullite($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$) substrate could be observed through a looking glass during the methane pyrolysis at the temperature of 1050°C in the present study, while it was found on the Alsint(Al_2O_3) substrate at the temperature of 1500°C in the past study. If the surface of substrate would be smeared strongly with iron metal, then finely sticked Fe was more effective catalytic for nm-sized whisker growth. Numerous fine flakes of pyrolytic carbon were hanging from invisible nm-whisker as like as small spiders hanging from the spiderweb. This was the identification of nm-whisker growth. Therefore if the pyrolysis would be stopped at the initial stage of the whisker growth, the primary growth was nm-sized whisker. So we could vary sizes from nm- to μm -sized whisker arbitrary. The lengthening growth forms of the whisker was depended on the flow pattern of pyrolysis species on the substrate surface and on the growth duration. We could obtained straight whisker length of 10 - 20 mm/min during the primary growth and levorotatory spiral whisker with a diameter of 30 - 40 μm /hr during the secondary growth.