Mesoporous Silica Powders as a Biomolecular Probes

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Abstract

This work describes the innovative development of high throughput biomolecular probes such as a human DNA using the molecular self-assembled mesoporous silicas. The mesoporous silicas were prepared by sol-gel method and the formation of molecular self-assembled monolayers with functional groups was chemically demonstrated. The surface modification of functional groups was performed with aminofunctionalized organic silanes on mesoporous silicas. Surface properties of aminofunctionalized organic silanes on mesoporous silicas were studied by Brunuaran Emmett Teller (BET). The result of BET showed the decreasing of the surface area on amine functional group. And thermal properties of amine of functionalized organic silanes on mesoporous silicas were studied by Thermal Gravimetric Analysis (TGA). From thermal analysis, we showed that the weight loss percentage increased by aminofunctionalized organic silanes on mesoporous silicas. The data of DNA recognition was represented with electrophoresis images. The result shows the optimum effect on functional groups and efficiency and large yields of DNA-recognition with mass production. The use of functionalized mesoporous silica for biomolecular recognition gives a lot of advantages rather than use of conventional silica based materials.

Sintering Characteristics of Aluminum Doped SiC Fiber

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Abstract

Continuous SiC fiber doped with aluminum as a sintering additive was prepared through the conventional Nicalon\textsuperscript{5} SiC fiber process. A green polymer fiber was obtained by the melt spinning of the polyaluminocarbosilane which is synthesized by the reaction of polydimethylsilane with 5\% aluminum acetylacetonate under catalytic condition. The spun fiber was cured in air at 200°C before pyrolysis under controlled heat-treatment atmosphere and sintering condition. Sintered fiber was characterized using XRD, FE-SEM and HR-TEM. In this study, we described the effect of aluminum on the SiC grain growth and the fiber densification during the sintering process. When aluminum concentration exceeded the upper limit of solid solubility in the SiC crystal at the temperature of 2000°C, abnormal grain growth of SiC crystal was observed and some second phase were observed. Appropriate aluminum concentration and sintering condition for fully dense and uniform grain dispersed SiC fiber was investigated.