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Structure and properties of polymer-derived SiCN ceramics

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Polymer-derived ceramics (PDCs) are a new class of ceramics synthesized by thermal decomposition of polymeric precursors. Unlike conventional ceramics prepared by sintering the corresponding powders or amorphous film prepared by various physical /chemical depositions, PDCs possess unique structure, which can be described as nanodomain structures. This unique structure confers many unusual and superior properties to the materials, including excellent high-temperature stability and unique electric properties. The materials are very promising for widespread high-temperature applications. Fundamental understanding of the structure and its evolution, as well as structure-property relationship of the materials is therefore both fundamentally and practically interesting. In this paper, the structure of a polymer-derived amorphous silicon carbonitride (SiCN) ceramic was investigated by using NMR, EPR and Raman. The structural evolution of the material as a function of the pyrolysis temperature was also studied. A thermodynamic model was proposed to account for the structural evolution. We also investigated the electric behavior of the material. The structural mechanism was proposed and discussed.

Biography

Xuqin Li is currently a Ph.D. student in School of Materials Science and Engineering, Northwestern Polytechnical University. Her research is focused on fundamentally studying the structure, structural evolution and property-structure relationship of polymer-derived amorphous ceramics.

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Chitosan/gelatin microspheres prepared by modified emulsification and ionotropic gelation

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This paper describes the encapsulation of virgin coconut oil in a matrix of chitosan (CS) and gum arabic (GA) blend by emulsification followed by ionotropic gelation method. Soy and rice proteins were used as emulsifiers and Tripolyphosphate (TPP) as cross-linker. Emulsion stability, the shape, size, encapsulation efficiency and swelling behaviour of the beads loaded with virgin coconut oil were analysed. Results showed that the morphology and size of the beads were affected by the concentration and ratio of wall materials, the viscosity of chitosan solution, the percentage of cross linking agent, time of curing and dropping distance from the surface of TPP solution. Chitosan solution at 3-4% w/v produced spherical, tiny, compact beads with tails. The encapsulation efficiency of more than 90% was obtained with the combination of soy protein, chitosan and gum arabic at a concentration of CS:GA 7:1. Swelling tests were done in acetate buffers with different pH ranges (3.5, 5.5 and 7.5). Acidic pH showed faster swelling whereas alkaline pH took longer time for swelling; however, the stability was better (no erosion even after 48 hrs of incubation).

Keywords: Soy/rice protein, Emulsion, Virgin coconut oil, Chitosan, Gum Arabic, Encapsulation.

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