

Study of the Atomic Structure and Phase Separation in Amorphous Si-C-N Ceramics by X-Ray and Neutron Diffraction

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Amorphous $\text{Si}_{37}\text{C}_{32}\text{N}_{31}$ and $\text{Si}_{37}\text{C}_{29}\text{N}_{34}$ ceramics were produced by pyrolysis of a polyhydromethylsilazane precursor. Their structure was investigated by X-ray and neutron diffraction. Wide angle diffraction showed that the Si-atoms are preferentially bonded to nitrogen atoms, but also bonding to carbon atoms was found. This suggests that the excess carbon atoms form an amorphous graphite-like phase. Small angle scattering revealed that the ceramics are inhomogeneous. The evolution of the phase separation during annealing was investigated and it was concluded that amorphous Si_3N_4 precipitates grow in the Si-C-N materials. The results are compared with previous results for amorphous $\text{Si}_{24}\text{C}_{43}\text{N}_{33}$ produced from a polysilylcarbodiimide precursor [1 - 3].

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