Preparation of SiC Powders by CVD Method Using RF-Plasma

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The effect of reaction conditions on the chemical composition and particle size of the powders was studied in the preparation of silicon carbide from the SiC_4-CH_4-H_2 system by using RF-plasma. Reaction product was β-SiC by X-ray diffraction. Under the condition of $[SiCl_4]=0.1$ vol % and $[CH_4]=0.13$ vol %, the C/Si ratio of the powders increased sharply with decreasing $[H_2]$ below $[H_2]/[CH_4]<15$ and the increase in the C/Si ratio was remarkable at higher reaction temperature. When $[H_2]/[CH_4]>15$, the C/Si ratio was approximately unity and independent of $[H_2]$. On the other hand, the C/Si ratio increased moderately with increase of $[CH_4]$, and thus the C/Si ratio could be controlled easily by the control of $[CH_4]$. The crystallite size, D_{111} of SiC powders had a tendency to increase with increasing reaction temperature. This may be due to the decrease in supersaturation ratio at higher temperature.
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Mirrorlike Region of Fractured Surface of Sintered Si_3N_4 under Rotary Bending

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The rotary bending test was carried out on sintered Si_3N_4 at room temperature within the range from 10^4 to 10^8 stress-cycles by using an Ono's rotary bending fatigue testing machine operating at 3400 cycles per minute. It was observed that fractured surfaces of tested specimen had regions like mirror which appeared in those after the static test. The size of mirrorlike region was also correlated with the stress amplitude and number of cycles to failure. Mirrorlike region seemed to be restricted to the subcritical crack growth under the cyclic stress.
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Preparation of $Pb(Zr,Ti)O_3$ by Oxalate Method in Ethanol Solution (Part 2)

Effect of Preparation Conditions to Particle Size

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$Pd(Zr_{0.5}Ti_{0.5})O_3$ (PZT) was prepared by calcining the oxalates which were co-precipitated by addition of a Pb, Zr, Ti-aqueous solution to oxalic acid in ethanol. Particle size and crystallinity were strongly influenced by the preparation conditions, such as reaction temperature, excess amount of oxalic acid, and addition rate of both metallic component solution and ammonia solution. The addition of an ammonia solution was necessary in order to precipitate completely the metallic componets. The PZT powders were characterized by means of X-ray diffractometry, SEM observation, and measurement of particle size distribution. Lowering the reaction temperature decreased the particle size and increased the relative amount of tetragonal perovskite phase. When the oxalation temperature was 5°C, for instance, the particle size was around 0.15 μm after calcining at 800°C, and tetragonal single phase, the c/a value of which was 1.029 agreed with the reference, was obtained by calcining at 1000°C. On the other hand, the rapid addition of metallic component solution, the slow addition of ammonia solution and the use of oxalic acid in 10 mol% excess had an effect to produce the finely particulated powders.
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