Electron Microscopic Studies on Alkaline Earth Carbonates. (II)

Electron Microscopic and Diffraction Studies on Precipitated Particles

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Alkaline earth carbonates precipitated with carbon dioxide were studied by electron microscopy and diffraction method. The shapes of particles of calcium, strontium, and barium carbonates were cubic or spindle, spindle, and rod respectively. The size of particles of single carbonates decreased with increasing concentration of hydroxide solution. When the reagents were suspension, however, the particle size was almost independent of the concentration of hydroxide because the concentration of hydroxide in the solution was almost constant for various quantites of reagent. Calcium carbonate particles formed from sparingly soluble calcium hydroxide were nearly monodisperse, but strontium and barium carbonate particles formed from soluble hydroxides were polydisperse. The precipitates of calcium-strontium mixed carbonate, and calcium-barium mixed carbonate were the mixture of each single carbonate, because the formation of calcium carbonate was late and the crystal structure of calcium carbonate was different from that of strontium and barium carbonates. The strontium-barium mixed carbonate was the mixed crystal of strontium and barium carbonates. The precipitates of calcium-strontium-barium mixed carbonate contained both mixed and single crystals. These analyses were made by the high resolution electron diffraction and the selected area electron diffraction techniques.

Brittle Fracture and Spinnability of Viscous Materials

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Types of mechanical fracture or break-down of viscous materials such as rosin, asphalts and plasticized high polymers were examined at various rates of extension. It was found that the critical velocity for brittle fracture and for dropping break-down increased exponentially with increasing temperature. Creeping or spinnable extension was observed between these two limiting conditions.

For the aqueous solutions of glycerine, cane sugar *etc.*, spinnability was examined by the pulling up method. It was suggested that spinnability at a

constant rate of extension (v) depends largely upon viscosity (η) and surface tension (γ) as well as temperature. Assuming that the apparent relaxation time can be given by a balance between viscosity and surface tension, the spinning condition was derived as follows:

$$\eta \geq \gamma / v.$$

The spinning temperature expected from the above relation showed a good agreement with the experimental results.

Dielectric Properties of Polyethylene Glycols at Microwave Frequencies

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The complex dielectric constants of ethylene, diethylene, triethylene, tetraethylene, and hexaethylene glycols in the liquid state have been measured at frequencies of 1.43, 9.73, and 18.7 kmc/sec at temperatures from 5 to 50°C. The parameters of dielectric relaxation for these polyethylene glycols have been calculated from the complex dielectric constants and the static dielectric constants by the circular arc rule of Cole and Cole. It has been found that the dielectric relaxation times obtained do not vary much with the homolog of this polyethylene glycol series, being of the order of 10^{-10} sec at 20°C. The value of relaxation time is the largest for diethylene glycol, decreasing slightly with higher homologs of this series. This striking feature is discussed in terms of flexibility of the polyoxyethylene chain due to internal rotation around the C-O bonds of the chain skeleton, which would make more possible a partial and independent orientation of the hydroxyl groups at the ends of the molecular chain in the case of higher polyethylene glycols.

Synthesis of Acetic Acid from Methanol and Carbon Monoxide under High Pressure

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Kinetic studies were made on the synthesis of acetic acid by the reaction of $CH_3OH \cdot BF_3$ with carbon monoxide under high pressure, the main course being expressed by

$$CH_3OH \cdot BF_3 + CO \longrightarrow CH_3COOH \cdot BF_3 \qquad (1)$$