

Studies on the dielectric loss of polycrystalline material produced from the glass of the system $\text{Li}_2\text{O-MgO-Al}_2\text{O}_3\text{-SiO}_2$. Sumio Sakka and Megumi Tashiro. *Yogyo Kyokai Shi*, **69**, 393 (1961), in Japanese.—See, this Bulletin, **39**, 411 (1961).

Some considerations on the measuring method of the thixotropic properties of some clay slips. Kaoru Umeya. *Zairyo Shiken (J. Japan Soc. Testing Mater.)*, **10**, 328 (1961), in Japanese.—See, this Bulletin, **39**, 412 (1961).

Thixotropy of clay suspensions. Kaoru Umeya, Kazuhiro Yoshizaki and Tatsuo Kitagawa. *Kagaku Kogaku*, **25**, 341 (1961), in Japanese.—Review article.

Theories on the forming procedure of powdered materials. Kaoru Umeya. *Kagaku to Kogyo (Tokyo)*, **14**, 349 (1961), in Japanese.—Review article.

Relationships between thermal expansion and packing of particles of refractory clay bodies. Susumu Nagasaki, Akira Watanabe, Kazuhiro Yoshizaki and Kaoru Umeya. *Yogyo Kyokai Shi*, **69**, 323 (1961), in Japanese.—See, this Bulletin, **39**, 413 (1961).

Optical properties of irradiated LiF crystals in the extreme ultraviolet. Riso Kato. *Bull. Inst. Chem. Res., Kyoto Univ.*, **39**, 153 (1961).

Color centers in Cu-doped NaCl and KCl crystals. Kuniya Fukuda and Toshiko Nakagawa. *Bull. Inst. Chem. Res., Kyoto Univ.*, **39**, 158 (1961).

Effects of gamma-ray irradiation on rochelle salt. Koichi Toyoda, Akira Kawabata and Tetsuro Tanaka. *Bull. Inst. Chem. Res., Kyoto Univ.*, **39**, 189 (1961).

The sub-structure in single crystals of nickel. Shigeo Maeda. *Bull. Inst. Chem. Res., Kyoto Univ.*, **39**, 278 (1961).

Physical Chemistry

Particle characteristics and particle sizes of powders. Eiji Suito. *Preprints of the 25th Anniversary Congress of The Society of Chemical Engineers, Japan*, Nov. 8, (1961), in Japanese.—Various apparatus which were devised by author for particle size determination and were named as "Sedimentograph", "Autosizer" and "Permeasizer" were reviewed. The relations between the particle size and the particle characteristics, such as particle shapes, surface state and secondary state of aggregation which were obtained by measuring the particle sizes of various powder by means of these apparatus were discussed.

A new apparatus for the mean size determination of powder "permeasizer". Masafumi Arakawa. *Micromeritics*, No. 7, 17 (1961), in Japanese.—An automatic apparatus for the direct indication of the mean particle size of powder has been designed. This apparatus measured the average particle size by determining the

permeability to a regulated air flow impacted by a sample powder bed. In operation a uniformly regulated flow of dry air is passed through the sample column. The resistance of the sample bed to the air flow produces an increase in pressure, shown by a Aneroid type pressure gauge. A pointer is set at the thickness of powder bed then the indicator shows the average particle size directly on the gauge dial. The measuring range of particle size is from 100 microns to 0.5 micron.

Indented growth front of single micro-crystal of colloidal gold. Eiji Suito and Natsu Uyeda. *Proc. Japan Acad.* **37**, 388(1961).—The mechanism of the crystal growth of colloidal gold in the suspension was studied by the use of the electron microscope. The perimeter of the growing crystal is anomalously indented. When the growth comes to an end, the perimeter turns to the sharp straight lines. Even when the crystal grows making spiral loops, the situation is quite the same. The phenomena may be caused mainly by the mosaic growth of the entire crystals in the sol.

The indented perimeter as the growth front of the lamellar single micro-crystal of colloidal gold. Natsu Uyeda. *J. Electron-microscopy* (Tokyo), **10**, 170 (1961).—The single micro-crystal of gold grows on its (111) habit surface as a lamella of about 100 Å thick when prepared under the acidic condition, sometimes being accompanied even by the spiral growth steps. The aspect of the growing crystal was observed by the electron microscope at several intermediate stages. The most characteristic feature is the anomalously indented or densely fringed perimeter, which finally disappears leaving the sharp straight lines when the growth comes to an end. It seems very reasonable to consider that the small particles of colloidal gold of ordinary size or much less are absorbed on the side surface of the perimeter and arrange themselves so as to be well fitted to the lattice of the main crystal. The indentation of the perimeter also appears when the crystal undergoes the spiral growth.

Viscoelastic properties of asphalts. Hiroshi Aida. *Sekiyu Gakkai Shi*, **4**, 845 (1961).—See, this Bulletin, **40**, 404 (1962).

Brittle fracture of asphalts. Hiroshi Aida. *Nippon Kagaku Zasshi*, **82**, 1134 (1961), in Japanese.—The change in the tensile force of several kinds of asphalts was recorded at various temperatures and rates of extension. The critical velocity for brittle fracture, V_b , was defined as the velocity at the discontinuous breakdown of tensile force without deformation. V_b increased exponentially with increasing temperature T , and V_b-T curve shifted to lower temperature region with the increase of the ratio of oils to asphaltenes or that of resins to asphaltenes in asphalt. It was assumed that asphalt is Maxwell liquid as the first approximation and that the brittle fracture occurs when the elastic energy exceeds the energy of cohesion (K). According to the above model, it was derived that at the critical velocity, the breaking time was proportional to the mean relaxation time τ and that τV_b was proportional to $\sqrt{K/G}$. (G is the instantaneous elastic modulus). These relations were qualitatively confirmed by the experimental results.

Heterogeneous properties in the fracture. Hiroshi Aida. *Nippon Kagaku Zasshi*, 82, 1139 (1961), in Japanese.—The change in the birefringence of resin was recorded at various rates of extension by 16 mm cinecamera, and the behavior at the moment of brittle fracture were also recorded by a high speed camera. It was shown that the stress distribution in the sample became more heterogeneous with the increase of the rate of extension, and that cracks were formed locally and propagated spontaneously in the direction perpendicular to the direction of extension. In short, brittle fracture of viscoelastic materials starts from the point of stress concentration which is induced more easily at higher rate of extension.

Dielectric properties of emulsions. III. Dielectric behavior of W/O emulsions. Tetsuya Hanai. *Kolloid-Z.* 177, 57 (1961).—See, this Bulletin, 39, 407 (1961).

A remark on the theory of the dielectric dispersion due to the interfacial polarization. Tetsuya Hanai. *Kolloid-Z.* 175, 61 (1961).

Temperature dependence of dielectric constants and dipole moments in polar liquids. Tetsuya Hanai, Naokazu Koizumi and Rempei Gotoh. *Bull. Inst. Chem. Res., Kyoto Univ.* 39, 195 (1961).

Dielectric theory on the interfacial polarization for two-phase mixtures. Tetsuya Hanai. *Bull. Inst. Chem. Res., Kyoto Univ.*, 39, 341 (1961).

Inductive effect of substituents on the symmetrical deformation frequencies of aliphatic hydrocarbons. Tohru Takenaka. *Nippon Kagaku Zasshi*, 82, 1309 (1961), in Japanese.—See, this Bulletin, 39, 407 (1961).

Inductive effect of polar substituents on carbon-hydrogen stretching vibrations of aliphatic hydrocarbons. Rempei Gotoh and Tohru Takenaka. *Bull. Inst. Chem. Res., Kyoto Univ.*, 39, 202 (1961).

Adsorption isotherm for heterogeneous surface. 2. The effects of induced heterogeneity and of interaction energy between the adsorbed particles on the decrease of the heat of adsorption. Shoji Umeda and Kimio Tarama. *Bull. Inst. Chem. Res., Kyoto Univ.*, 39, 267 (1961).

Infrared studies of rubber-filler system. I. Infrared spectra of various fillers. Eiji Suito and Masafumi Arakawa. *Nippon Gomu Kyokaishi*, 34, 884 (1961), in Japanese.—The infrared spectra of rubber-filler system are important for the investigation of the effect of filler for rubber. Although the infrared spectra of rubbers and elastomers have been investigated by several authors, the literature contains no extensive collection of infrared spectra of fillers. In the present work the spectra of 33 practical fillers are given. These spectra are useful for the identification of fillers.

Infrared studies of rubber-filler system. II. Infrared spectra of rubber compounded with filler. Eiji Suito and Masafumi Arakawa. *Nippon Gomu Kyokaishi*, 34,

894 (1961), in Japanese.—The conventional techniques for the infrared analysis are not available for the cured rubber compounded with filler. In the present work, a microtome of freezing type is used for the preparation of thin section of cured rubber compounded with filler as the sample for infrared analysis. The microtome technique here has been applied to a rubber analysis, and, at the same time, this makes it possible to identify the filler contained in rubber. Several examples of infrared spectra of those thin sections, such as natural rubber and SBR-filler systems, are shown.

Polymer Chemistry

Das scheinbare spezifische Volumen von fadenmolekularen Polyelektrolyten in Lösung. Hiroshi Inagaki und Akio Teramoto. *Makromol. Chem.* 47, 185 (1961).—Durch die Schwimmermethode wurden die scheinbaren spezifischen Volumina von celluloseglykolsäuren Natrium und Methylcellulose im Wasser bestimmt, um das Verhalten des Wassermoleküls um das Makroion aufzuklären. Der Wert für Methylcellulose stimmte mit dem nach der Additivitätsregel von Cohn et al. berechneten ziemlich gut überein, während er für das Polyelektrolytmolekül, d. h. das celluloseglykolsäure Natrium, etwa 10 % kleiner war als der berechnete. Es wurde auch festgestellt, daß das scheinbare spezifische Volumen des celluloseglykolsäuren Natriums mit Zunahme der Zusatzsalzmenge (NaCl) allmählich zunimmt. Diese Befunde wurden im Vergleich mit dem Fall der Proteine und auch auf Grund der thermodynamischen Theorie für die Dichte, die bisher von uns entwickelt wurde, diskutiert. Durch diese Erörterung führten wir einen neuen Begriff, nämlich „das gesamte Covolumen“, zur systematischen Deutung der von der Additivitätsregel abweichenden zusätzlichen Volumina ein, welche als Elektrostriktions und Endgruppeneffekte, sowie als ausgeschlossenes Volumen im Sinne von Charwood bekannt sind.

Dynamic viscoelastic behavior of concentrated polymer solutions. 1. Results of some preliminary tests and comparison of dynamic and steady shear data. Tadao Kotaka and Kunihiro Osaki. *Bull. Inst. Chem. Res., Kyoto Univ.*, 39, 331 (1961).

Lattice theory of chain polymer solutions. Michio Kurata. *Ann. New York Acad. Sci.* 89, 635 (1961).—The lattice theory of polymer solutions is extended by including in the hypothesis a number C of intramolecular segment-segment contacts; C does not approach zero at infinite dilution. This treatment predicts a decrease of the second virial coefficient A_2 and of the theta temperature with increasing molecular weight for coiling polymers in solution. The theory agrees with the experimental data of Krigbaum and Geymer (*J. Am. Chem. Soc.* 81, 1859 (1959)) for cyclohexane solutions of polystyrene at 34°C up to volume fraction 0.4 of polymer.

Spontaneous extension of high molecular substances. Waichiro Tsuji, Ryoza Kitamaru and Ryutoku Yosomiya. *Kobunshi Kagaku*, 18, 205 (1961), in Japanese.—See, this Bulletin, 39, 330 (1961).