Dr Takeo Ozawa

ELSEVIER

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Dr. Takeo Ozawa and his Scientific Career

Dr. Takeo Ozawa was born on February 14, 1932, in Yokohama Japan. Yokohama is an international city with the biggest harbor in Japan and famous Chinatown. Such was the atmosphere in which he grew up.

He majored in chemistry at the University of Tokyo and he graduated with a B.Sc. in 1955. After finishing his Master's course in 1957, under the direction of Professor H. Kambe a former President of ICTA, Dr. Ozawa immediately joined the Electrotechnical Laboratory ETL, Agency of Industrial Science and Technology, Ministry of International Trade and Industry. He and his wife, Hisae, raised two children: one daughter and one son.

He worked at ETL for 30 years. His first job at ETL was the research and development of electrical and electronic insulating materials. He applied various thermoanalytical methods to evaluate the thermal characteristics of these materials. It should be noted that kinetic analyses of thermoanalytical data are quite powerful tools for this purpose. One of his many scientific contributions to kinetic theory is the so-called "Ozawa Plot". It is a simple plot of the logarithm of the heating rate against the inverse of the absolute temperature, for various reaction rates, and the activation energy can easily be obtained from the plot. It has been widely used in various fields of research and industrial tests from polymers to ceramics.

Energy storage was also his concern. As Chief of the Electronic Chemistry Section, and of the Energy Storage Section, he was engaged in the R&D of energy storage by electrochemical and thermal methods. Engineering might be defined to be a means to discover the most effective way to a goal from all the options. In this sense he used thermal analyses quite effectively for the R&D of thermal storage. When oxide superconductors were found in 1986 he quickly applied thermoanalytical techniques to the investigation of $YBa_2Cu_3O_{7-x}$: for example TG to find the nonstoichiometry and the kinetic analysis for the perovskite formation process.

When most of the national laboratories of Tokyo were moved to Tsukuba Science City, located 60 km north of Tokyo in 1979, he tried to make use of the cumulative effect of the many research organizations, to promote cooperation among researchers of thermal properties measurement, and he has always been at the center of the circle of thermal analysts and calorimetrists in Tsukuba.

In 1987 he moved to Daicel Chemical Industries Ltd. As the first Director he established the newly-founded Tsukuba Research Center. He has been engaged in the R&D of electronic materials and other polymeric materials there and is now the Honorary Director of Tsukuba Reseach Center.

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Takeo Ozawa has authored or co-authored around 100 original scientific papers and more than 100 reviews and commentaries as well as a few books on thermal analysis, thermal deterioration and fuel cells. The titles of his representative original papers are given below. Most of his work is in thermal analysis, and its application to materials, which is the theme of this special issue. In some other papers, however, the performance of energy storage units is discussed. As can be seen his range of interests extends from pure science to engineering applications.

As for his scientific achievements: he received the Mettler Award from the North American Thermal Analysis Society in 1981; in 1986 "Latent thermal storage using pentaerythritol slurry", a co-authored paper, was designated the Best Energy storage Paper at the 21st Intersociety Energy Conversion Engineering Conference by the American Society of Mechanical Engineers; and he received the Kurnakov Medal from the Kurnakov Institute for General and Inorganic Chemistry of the Russian Academy of Sciences in 1994. He also was given a Plaque from the editorial board of the Journal Netsu Sokutei during the 10th ICTA Congress in 1992. The University of Tokyo granted him a Doctor of Science in 1980. The title of his doctoral thesis is "Non-isothermal Kinetics and its Application to High Polymers".

Dr. Takeo Ozawa has contributed to several academic societies by serving as President, Chairperson and member of committees of the International Confederation for Thermal Analysis and Calorimetry (ICTAC), the Society of Calorimetry and Thermal Analysis, Japan, the Japanese Academic Council, the Japan Society for Thermophysical Properties, the Chemical Society of Japan, the Society of Polymer Science, Japan and the Institute for Electrical Engineers, Japan. He has been involved with ICTA (ICTAC) since 1974, when he was a member of the Organizing Committee of the 5th ICTA Congress, and has been a member of the Standardization, Nomenclature, Education and Kinetics Committees. He has been President of ICTAC since 1992. His involvement with the Society of Calorimetry and Thermal Analysis, Japan, dates back to 1969 and he was President of that Society from 1993–1995. He was President of the Japan Society for Thermophysical Properties in 1995–1996. He is now the President of the Society for Promotion of Calorimetry and Thermal Analysis, Japan. Dr. Ozawa has been a member of the Editorial Advisory Board for *Thermochimica Acta* since the first volume was issued. Beside the above he has been chairman and member of more than 20 academic committees and about 10 governmental committees, and chairman, secretary and member of about 30 committees of industrial associations.

Dr. Ozawa is known for his theoretical evaluations, he likes to make things, and he has developed new apparatus for thermal analysis and thermal conductivity measurements. A redox flow battery of 1 kW and a 30 kWh latent thermal storage unit using high density polyethylene were developed under his leadership. A 200 kW demonstration plant of the redox flow cells will be tested in the private sector this coming spring. He likes to listen music and to read books. Among his many hobbies, however, cooking should be most emphasized. His specialties are Western and Japanese meals as well as wonderful cooking demonstrating analytical problems.

This special issue of Thermochimica Acta is dedicated to Dr. Takeo Ozawa on the occasion of his 65th birthday. It consists of 45 papers on thermoanalytical and

standardization materials contributed by the researchers in the field to show their appreciation for him. The above title still does not seem broad enough to cover all the research areas within his interests.

Joseph H. Flynn
Masayuki Kamimoto
Jaroslav Šesták

A list of selected papers

[1] *Methodology of Thermal Analysis and Thermal Conductivity*

(1) A new method of analyzing thermogravimetric data. Takeo Ozawa, Bull. Chem. Soc. Jpn., 38 (1965) 1881.
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(3) A novel type of differential thermogram revealed in potassium molybdate. Takeo Ozawa, Bull. Chem. Soc. Jpn., 39 (1966) 2307.
(4) Heat measurement by differential thermal analysis. H. Isozaki, M. Momota and T. Ozawa, Bull. Chem. Soc. Jpn., 40 (1967) 545.
(5) Kinetic analysis of derivative curves in thermal analysis. Takeo Ozawa, J. Thermal Anal., 2 (1970) 301.
(6) A new type of quantitative differential thermal analysis. H. Isozaki, A. Negishi and T. Ozawa, Thermochim. Acta, 1 (1970) 545.
(7) Kinetics of non-isothermal crystallization. Takeo Ozawa, Polymer (London), 12 (1970) 150.
(8) The effect of grinding on DTA curves of silver nitrate. A. Negishi and T. Ozawa, Thermochim. Acta, 2 (1970) 89.
(9) Non-isothermal kinetics of diffusion and its application to thermal analysis. Takeo Ozawa, J. Thermal Anal., 5 (1973) 563.
(10) The peak of the derivative thermoanalytical curve of diffusion. Takeo Ozawa, J. Thermal Anal., 6 (1974) 401.
(11) Critical investigation of methods for kinetic analysis of thermoanalytical data. Takeo Ozawa, J. Thermal Anal., 7 (1974) 601.
(12) Potential temperature standards for torsional braid analysis. Y. Takahashi and T. Ozawa, J. Thermal Anal., 8 (1975) 125.
(13) Some demonstrations of the effect of the heating rate on thermoanalytical data. Takeo Ozawa, J. Thermal Anal., 9 (1976) 217.
(14) A modified method for kinetic analysis of thermoanalytical data. Takeo Ozawa, J. Thermal Anal., 9 (1976) 369.
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(17) Non-isothermal kinetics and generalized time. Takeo Ozawa, Thermochim. Acta, 100 (1986) 109.
(18) Applicability of Friedman plot. Takeo Ozawa, J. Thermal Anal., 31 (1986) 547.
(19) A simple kinetic relation of derivative thermoanalytical curves. Takeo Ozawa, Thermochim. Acta, 124 (1988) 389.
(20) A new approach to kinetic study of nucleation and growth process by thermal analysis. Takeo Ozawa, Thermochim. Acta, 135 (1988) 85.
(21) A simple method for estimating activation energy from derivative thermoanalytical curves and its application to thermal shrinkage of polycarbonate. T. Ozawa and T. Kato, J. Thermal Anal., 37 (1991) 1299.
(22) Estimation of activation energy by isoconversion method. Takeo Ozawa, Thermochim. Acta, 203 (1992) 159.
(23) Non-isothermal kinetics on parallel competitive reactions of the same mechanism. T. Ozawa, J. Thermal Anal., 39 (1993) 1117.
(24) A method for kinetic analysis of thermoanalytical data of competitive reactions. T. Ozawa, K. Kanari, Thermochim. Acta, 234 (1994) 41.
(25) Linearity and non-linearity in DSC: A critique on modulated DSC. T. Ozawa and K. Kanari, Thermochim. Acta, 253 (1995) 183.

[II] *Polymeric Materials*

(1) Molecular weight determination of polyamides by vapor pressure osmometry. M. Ohama and T. Ozawa, J. Polym. Sci., A-2, 4 (1966) 817.
(2) The thermal conductivity of polytetrafluoroethylene. T. Ozawa and K. Kanari, J. Polym. Sci., B, 5 (1967) 767.
(3) Mass spectrometric thermal analysis of poly (methyl methacrylate) of high molecular weight. T. Ozawa, R. Sakamoto and M. Kanazashi, Thermochim. Acta, 3 (1971) 291.
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(5) Thermal conductivity of epoxy resins cured with aliphatic amines. K. Kanari and T. Ozawa, Polymer J., 4 (1973) 372.
(6) A short time method of thermal endurance of insulating varnish glass cloth by torsional braid analysis. Y. Takahashi, T. Kaneko and T. Ozawa, Trans. IEE Jpn., 99 (1979) 19.
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(11) Interaction between fillers and matrix in ABS resin composites observed by thermophysical properties. R. Tsukuda, S. Sumimoto and T. Ozawa, J. Appl. Polym. Sci., 59 (1996) 1043.

[III] *Latent Thermal Storage*

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(2) Investigation of latent heat thermal energy storage materials III. Thermoanalytical evaluation of pentaerythritol. R. Sakamoto, M. Kamimoto, Y. Takahashi, Y. Abe, K. Kanari and T. Ozawa, Thermochim. Acta, 77 (1984) 241.
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(5) Design and cost evaluation of solar energy and waste heat utilization system with latent thermal storage unit using formstable high density polyethylene. M. Kamimoto, Y. Abe, S. Sawata, T. Tani and T. Ozawa, J. Chem. Eng. Jpn., 19 (1986) 287.
(6) Investigation of latent heat thermal energy storage materials IV. Thermoanalytical evaluation of binary mixtures of NaOH with LiOH or KOH. Y. Takahashi, M. Kamimoto, Y. Abe, R. Sakamoto, K. Kanari and T. Ozawa, Thermochim. Acta, 121 (1987) 193.
(7) Investigation of latent heat thermal energy storage materials V. Thermoanalytical evaluation of binary mixtures of NaOH with $NaNO_3$ or $NaNO_2$. Y. Takahashi, M. Kamimoto, Y. Abe, R. Sakamoto, K. Kanari and T. Ozawa, Thermochim. Acta, 123 (1988) 233.
(8) Latent thermal storage using molten salts of sodium hydroxide --- Compatibility study of molten salts. Y. Abe, Y. Takahashi, R. Sakamoto, K. Kanari, K. Tanaka, M. Kamimoto and T. Ozawa, J. Chem. Eng. Jpn., 15 (1989) 977.

[IV] *Electrochemistry and Electrochemical Cells*

(1) Polarographic catalytic waves of titanium (IV) chelates of EDTA and related compounds. H. Kaneko and T. Ozawa, Bull. Chem. Soc. Jpn., 45 (1971) 140.
(2) Electrochemical estimation of reactivities of OH radical produced in Fe-EDTA-H_2O_2 system. H. Kaneko, K. Nozaki and T. Ozawa, J. Electroanal. Chem., 87 (1977) 149.
(3) Thin-films technology for solid electrolyte fuel cells by the RF sputtering technique. A. Negishi, K. Nozaki and T. Ozawa, Solid State Ionics, 3/4 (1981) 443.

(4) Numerical analysis on shunt current and pumping loss in a redox-flow cell system. K. Kanari, K. Nozaki and T. Ozawa, AIChE Symp. Series, 254 (1987).

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(2) Thermoanalytical investigation of the $YBa_2Cu_3O_{7-y}$ superconductor II. Perovskite formation from coprecipitated oxalate. A. Negishi, Y. Takahashi, R. Sakamoto and T. Ozawa, Thermochim. Acta, 132 (1988) 15.
(3) Thermoanalytical investigation of $YBa_2Cu_3O_{7-y}$ superconductor. III. Preparation from mixed 2-ethylhexanoates of yttrium, barium and copper. A. Negishi, Y. Takahashi, R. Sakamoto, T. Ozawa and M. Kamimoto, Thermochim. Acta, 140 (1989) 41.
(4) Application of thermal analysis to kinetic study of superconducting oxide formation. Takeo Ozawa, Thermochim. Acta, 133 (1988) 11.
(5) Synthesis of superconductors. M. Kamimoto and T. Ozawa, Thermochim. Acta, 148 (1988) 219.
(6) Volatility of metal beta-diketonates for chemical vapor deposition of oxide superconductors. Takeo Ozawa, Thermochim. Acta. 174 (1991) 185.