

Professor Chengye Yuan

A Tribute



Dedicated to Professor Chengye Yuan on the Occasion of His 80th Birthday

It is a privilege to write a tribute for this commemorative issue of *ARKIVOC* which is dedicated to Professor Chengye Yuan.

Professor Chengye Yuan was born in Shangyu, Zhejiang Province, China on September 12, 1924. He graduated from the National College of Pharmacy, Nanjing, China in 1948. He received the Degree of Candidate for D.Sc from the All-Union Research Institute of Pharmaceutical Chemistry, Moscow in 1955. He returned to Shanghai, China in 1956 and became a faculty member at the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences where he has worked for almost half a century. He was appointed Associate Professor in 1956 and was promoted to Full Professor in 1960. In fact, he was the youngest full professor in the Chinese Academy of Sciences in east China at that time.

In 1958, in order to meet the demands of the country, he established and led a research group for metal extraction. In the following years, Yuan's group developed a number of extractants for various metals, some of which are still in use today in the mining industry of China. Their efforts made very positive contributions to the country.

In the seventies, Professor Yuan and his colleagues introduced several new and effective extractants for the separation of rare earth and other non-ferrous metals, particularly cobalt, nickel and precious metals. For example, Yuan's group improved the synthetic method of extractant P507, and applied it in the manufacture of individual rare earth elements in high purity and the industrial separation of nickel and cobalt. Later they improved the synthetic method of P507 that significantly lowered its cost. Another example is N503. Taking advantage of its unique structure, they successfully applied N503 in the separation of niobium and tantalum in a hydrofluoric acid system. They also used it in the recovery of phenol and its derivatives from industrial effluents, which played an important role in environmental protection.

Extractant P501 is another example. Yuan's group demonstrated that the application of P501 in the purification of electrolyte for hydrogen peroxide production had a remarkable simplifying effect on the technique and also improved the working environment.

Based on numerous experimental data, Yuan's group carried out an extensive investigation of structure-reactivity relationships in various extraction systems. They introduced quantum chemical calculations, molecular mechanics, pattern recognition and factor analysis for such studies and the results provided the basis for the design and prediction of the properties of extractants.

With rich experience in the synthesis of phosphorus-based extractants and in the study of structure-reactivity relationships, Professor Yuan extended his interests to basic research in the design and synthesis of organophosphorus compounds of biological interest. With the financial support of the National Natural Science Foundation of China, Yuan and his students achieved significant progress in the design and synthesis of biologically active organophosphorus compounds. They successfully developed a number of methods for novel and convenient syntheses of aminophosphonic acids and aminopeptides and achieved remarkable results in synthetic strategies for polyfunctionalized phosphonic acid derivatives. For example, the introduction of trifluoromethyl groups into organophosphorus compounds, especially phosphono-containing heterocycles dramatically enhanced their biological activities. They compared the stereochemistry of 1,3-dipolar cycloaddition of phosphono-containing silyl nitronates with that of the corresponding nitric oxides and very recently, they introduced a biocatalytic method for the synthesis of chiral phosphorus derivatives.

Because of his academic achievements, Professor Yuan was elected a Member of the Chinese Academy of Sciences in 1997.

As a senior and internationally well recognized scientist, Professor Yuan was also elected to the following positions: Member of the Board of Directors, Chinese Chemical Society (1982-1990); Member of the Standing Committee (1982-1991 and 1998-present), Chinese Society of Rare Earths; Charter member, Subdivision of Separation Science and Technology, Division of Industrial and Engineering Chemistry; American Chemical Society, Member of the Board of Directors, International Council on Main Group Chemistry. He also served as member of the Scientific Board of the International Conference on Phosphorus Chemistry (ICPC) at 1983 (Nice, France), 1986 (Bonn, FRG), 1989 (Tallinn, USSR), 1992 (Toulouse, France), 1995 (Jerusalem, Israel), 1998 (Cincinnati, USA), 2001 (Sendai, Japan) and 2004 (Birmingham, UK).

He has been a Visiting Professor in the Chemistry Department, University of Nice, France (1983), in the Department of Organic Chemistry, University of New South Wales, Australia (1991), and at the Laboratory of Coordination Chemistry, CNRS, Toulouse, France (1992). He also acted as Senior Visiting Scholar at Roker Hydrocarbon Research Institute, University of Southern California, Los Angeles, USA (1993).

Professor Yuan serves as member of Editorial Boards of HETEROATOM CHEMISTRY, PHOSPHORUS, SULFUR AND SILICON and SOLVENT EXTRACTION AND ION EXCHANGE.

Professor Yuan is the author of more than 300 scientific papers together with a monograph entitled "SOLVENT EXTRACTION OF RARE EARTH" (Academic Press, 1978). He is the chief contributor to one Chinese and two US Patents. He is also the recipient of six National Scientific Awards, including National Science Award (second class), Award for Progress and Technology

(second and third class) and National Invention Award (third class). In addition, he received the HLHL Prize in 2001 (Hong Kong).

As he approaches his 80th birthday, Chengye Yuan remains an enthusiastic researcher and dedicated mentor of Ph.D. students at Shanghai Institute of Organic Chemistry.

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Selected Publications of Chengye Yuan

1. Studies on organophosphorus compounds. LXIII. A new and facile synthetic route to protected phosphonodipeptides: a backbone for the formation of oligophosphonopeptides; Yuan, C.; Chen, S. *Synthesis* **1992**, 1124.
2. Studies on organophosphorus compounds. 68. A new and facile synthetic approach to alkylidenephosphonates; Li, C.; Yuan, C. *Tetrahedron Lett.* **1993**, 34, 1515.
3. Studies on organophosphorus compounds. 71. A new and facile synthesis of 3,4-disubstituted 2-pyrrolophosphonates; Yuan, C.; Huang, W. *Synthesis* **1993**, 473.
4. Studies on organophosphorus compounds. 80. Stereoselective synthesis of fused carbocyclic and isoxazoline rings via intramolecular cycloaddition of nitrile oxides derived from α -nitro alkenes; Yuan, C.; Li, C. *Tetrahedron Lett.* **1993**, 34, 5959.
5. Studies on organophosphorus compounds. LXXIII. Synthesis of phosphonopeptides by an in situ active ester method; Chen, S.; Yuan, C. *Synthesis* **1993**, 1074.
6. New strategy for the synthesis of functionalized phosphonic acids; Yuan, C.; Li, S.; Li, C.; Chen, S.; Huang, W.; Wang, G.; Pan, C.; Zhang, Y. *Pure Appl. Chem.* **1996**, 68, 907.
7. Studies on organophosphorus compounds. Part 96. Nucleophilicity of the isocyano carbon atom in diethyl isocyanomethylphosphonate. First generation of a phosphorylated nitrile ylide and new syntheses of pyrrolinephosphonates and pyrrolophosphonates; Huang, W. -S.; Zhang, Y. -X.; Yuan, C. *J. Chem. Soc., Perkin Trans. 1* **1996**, 1893.
8. Fluorinated organophosphorus compounds as a new class of agrochemicals; Yuan, C.; Huang, W.; Chen, S.; Zhang, Y. *Phosphorus, Sulfur, Silicon* **1999**, 144-146, 625.
9. *Candida rugosa* lipase-catalyzed enantioselective hydrolysis in organic solvents. Convenient preparation of optically pure 2-hydroxy-2-arylethanephosphonates; Zhang, Y.; Li, Z.; Yuan, C. *Tetrahedron Lett.* **2002**, 43, 3247.
10. Studies on organophosphorus compounds. 115. Kinetic resolution of hydroxy-alkanephosphonates catalyzed by *Candida antarctica* lipase B in organic media; Zhang, Y.; Yuan, C.; Li, Z. *Tetrahedron* **2002**, 58, 2973.
11. Enzymatic synthesis of optically active δ -hydroxy- β -ketoalkanephosphonates; Zhang, Y.; Xu, C.; Li, J.; Yuan, C. *Tetrahedron: Asymmetry* **2003**, 14, 63.