“Alkiviades Ch. Payatakes” Distinguished Lecture 2023

Crystals in everyday life: Applications in Technology and Medicine

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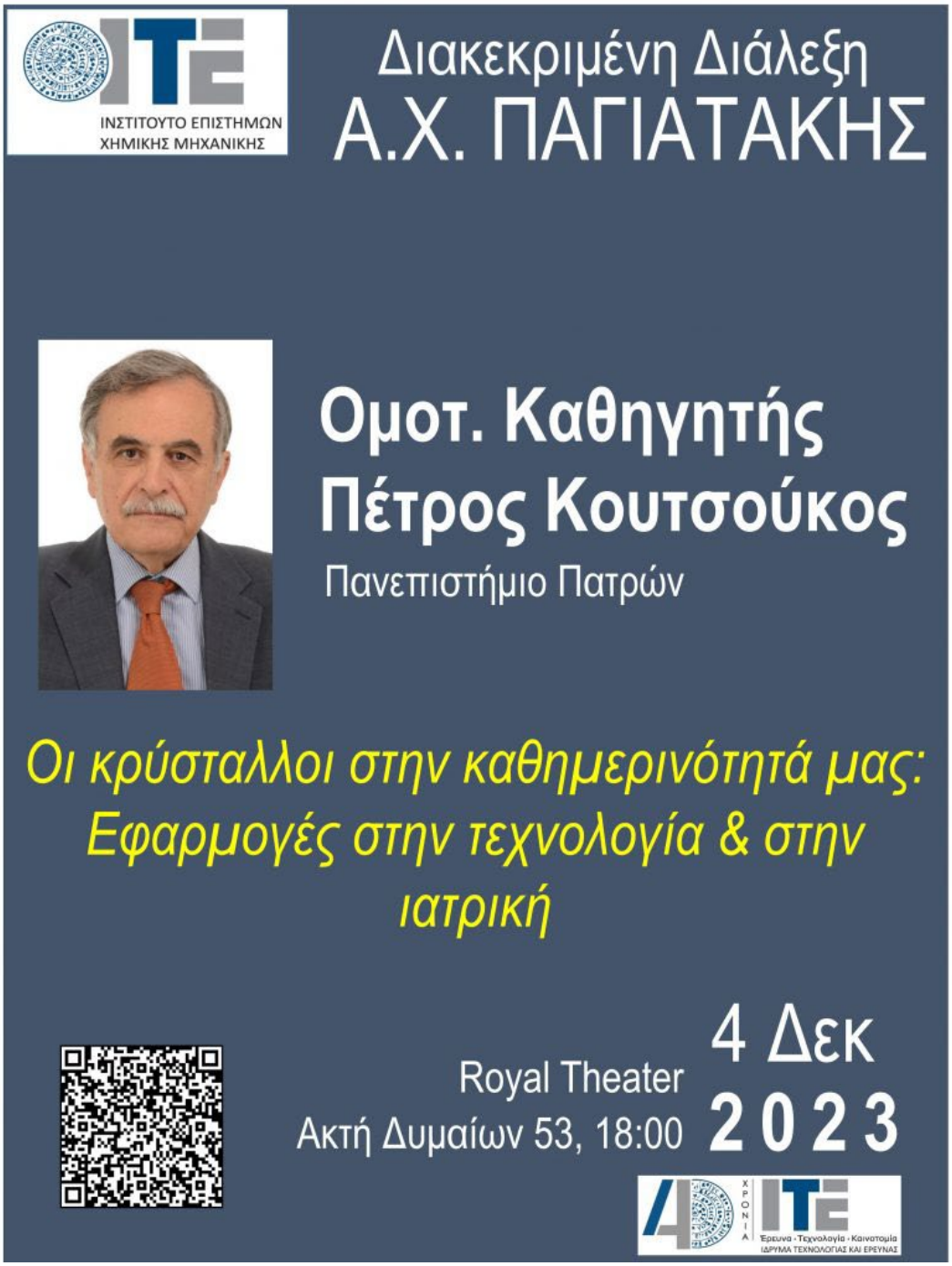

Abstract

The present talk is a contribution to the honour and academic commemoration of the late Professor Alkiviades Payatakes, a very special and unforgettable colleague, who honoured me with his collaboration in the exploration of an area related with the formation of crystalline deposits in a variety of media. The collaboration was very fruitful in many aspects and levels.

Very often, crystalline deposits form from aqueous media affecting a broad range and quite different extent human activities. The sufficient but not necessary condition for the formation and further development of crystal nuclei to macroscopic crystals is supersaturation with respect to a particular crystalline phase. The formation of crystalline materials may be either undesirable or desirable depending on where they form. Besides thermodynamics however, kinetics of crystal growth is of paramount importance for any practical application. Kinetics in all cases depend on the mechanism of formation of crystals and conversely the mechanisms can be elucidated from measurements of the rates of nucleation and crystal growth, as precisely as possible. In most practical cases crystals form on foreign surfaces (heterogeneous nucleation). Understanding of the respective parameters is the key to the development of applications both in the industry (e.g. scale formation prevention either on metallic surfaces or in oil wells during secondary oil production, the stabilization of sandy soils) and in medical applications (e.g. promotion of bone formation in damaged tissues , prevention of calcification of heart valves or intraocular lenses used for cataract treatment). In all cases, understanding the mechanisms of nucleation and crystal growth is the key for the development of novel materials and processes.

Short CV

Professor Emeritus of the Department of Chemical Engineering of the University of Patras, Ptichion of Chemistry University of Patras (1972), Diploma of Specialization in Business Administration (1974) (Athens School of Business and Economics) and Ph.D from the State University of New York at Buffalo, U.S.A. (1980). Ifigesia, University of Patras, 1984. Faculty member at the Department of Chemistry, University of Patras. 1989- 2018, Professor, Department of Chemical Engineering, University of Patras. 2018: honorary member of FORTH-ICEHT. Research interests include crystallization of inorganic salts from aqueous solutions, physicochemical phenomena at solid/ aqueous electrolytes interfaces, metals corrosion, biological mineralization and recovery of raw materials from wastewaters. Over 250 publications in refereed international journals, more than 40 chapters in books mainly concerning biological mineralization and industrial scale formation and prevention and over 150 of papers in proceedings of national and international conferences. 1994-2004 president and C.E.O. of the board of the Patras Science Park S.A. (PSP). 2015-2020 vice president PSP SA. 2006-2007 acting director of the Institute of Chemical Engineering and High Temperature Chemical Processes.