Faculty of Applied Science
CHEMICAL ENGINEERING
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## *"Photocatalytic Reaction Engineering"*

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## BIO

Hugo I. de Lasa is a Professor at the Department of Chemical and Biochemical Engineering, Faculty of Engineering of the University of Western Ontario. He graduated in 1968 with a Bachelor in Chemical Engineering from the Universidad Nacional del Sur in Argentina and in 1971 with a Doctoral degree from the Université de Nancy in France. Hugo de Lasa received in 2004 an *Honoris Causa* Doctoral degree in Chemical Engineering from the Universidad Autonoma de Zacatecas, Mexico. He is the founding Director of the University of Western Ontario's Chemical Reactor

Engineering Centre (CREC). Since its inception in 1987, this center has received significant financial support and has been collaborating with a diversity of industries and governmental agencies from about 20 countries.

Prof. de Lasa is the author of 240-peer reviewed publications, 6 books, and 11 U.S. and Canadian patents. He is an innovative teacher who has been actively involved in the training of graduate students with the successful supervision of 29 PhD and 27 MESc theses. Prof. de Lasa's activities have been of key importance for furthering the understanding of the science and the technology of chemical reactors. His original work deals with the application of chemical reactor engineering to environmentally friendly processes and products. Examples of Hugo de Lasa's inventions are the CREC-Riser Simulator, the Pseudoadiabatic Catalytic Reactor, the CREC-Optiprobes and the Photo-CREC reactors. In 2003, de Lasa funded Recat Technologies Inc (http://www.recattechnologies.com/) with the goal of commercializing CREC innovations and patents.

Hugo de Lasa has been actively involved in promoting important technical events: the 48$^{th}$ CSChE conference held in 1998, two NATO Advanced Study Institutes organized in 1985 and 1991, three United Engineering Foundation conferences held in 1997, 2001 and 2003, the 2002 Circulating Fluidized Bed Conference. He chaired the 2005-CRE X of the ECI on "Innovations in Chemical Reactor Engineering" held in Zacatecas, Mexico and the 2007-CRE XI "Green Chemical Reaction Engineering" held in Bilbao, Spain. Hugo de Lasa is the co-founding editor of the International Journal of Chemical Reactor Engineering.

In 1998, Hugo de Lasa received the Research Excellence Prize from the Faculty of Engineering Science of the University of Western Ontario. In 2000, he was designated Fellow of the Chemical Institute of Canada. That same year, he was awarded the Medal of Research and Development from the Professional Engineers of Ontario. In 2001, Hugo de Lasa received the Award in Industrial Practice and in 2004 the R.S.Jane Lecture Award, both from the Canadian Society for Chemical Engineering. In 2005 Hugo de Lasa was inducted as a Fellow of the Canadian Academy of Engineering.

**ABSTRACT**

The application of photocatalytic reaction technology holds great promise in these changing times. In order to take full advantage of photocatalysis one has to carefully examine the basic principles involved in modeling photocatalytic reaction rates. As well, it is important to establish, a methodology to develop a macroscopic radiation balance. This methodology allows the effective assessment of absorbed irradiation and irradiation transmission involving apparent extinction coefficients. Furthermore is equally relevant to account for the complex network of photochemical reactions to establish viable kinetic modeling. This modeling is based on a series-parallel model of the photocatalytic reaction network. Furthermore, the extensive applicability of photocatalysis has become an issue of energy efficiency. As a result, the quantification of these energy efficiency factors is a major issue. These factors can be considered from two perspectives: quantum efficiencies and Photochemical Thermodynamic Efficiency Factor (PTEF), the latter being a new efficiency factor introduced by the authors. Air decontamination is another potential innovative application of photocatalysis.. Several examples are provided by examining the photoconversion of acetone, iso-propanol, and acetaldehyde. Special attention is paid to the quantum efficiencies for air decontamination, exceeding 100% in many cases, which demonstrates the distinctive chain mechanism character of the photoconversion of organic pollutants in the air.

Once these concepts are established, a description is provided of novel photocatalytic reactors designed with special emphasis on Photo-CREC reactors, developed in the context of the author' research activities at the Chemical Reactor Engineering Centre (CREC) at the University of Western Ontario in London, Canada