College of Engineering
Department of
Mechanical & Industrial Engineering

Joint Sidney E. Fuchs / EPIC Seminar

3:30-4:20pm, Friday, November 21st, 2014
Frank H. Walk Room (ELAB Building)

Two-phase Liquid Flows in Small Channels

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Two-phase, liquid-liquid systems find many applications in the process and chemical industries. In particular solvent extraction is widely used for separations of e.g. metals and proteins but suffers from the high hazard ratings of common organic solvents. Ionic liquids (salts with very low melting points) have negligible vapour pressure and high thermal stability in normal operating conditions and are considered green alternatives to organic solvents. The production of the ionic liquids can be expensive though, and thus prevent their extensive use in large-scale systems. The application of intensified, small scale units in extraction processes can reduce the amount of solvent required and associated costs and make economically viable the use of expensive solvents such as ionic liquids. The ionic liquids have generally high viscosities and density higher than water and are expected to form different patterns in two-phase liquid flows compared to organic solvents.

The talk will cover the flow patterns observed in small channels with ionic liquid - water mixtures. The plug flow regime, which enhances mass transfer, has been investigated in more detail and velocity profiles and circulation times obtained with micro-PIV and non-conventional shadowgraphy will be presented and discussed. Mass transfer coefficients have been studied for the particular case of uranium extraction, relevant to reprocessing of spent nuclear fuel. Scale up (out) issues will also be considered.

* Prof. Angeli received her Diploma in Chemical Engineering from the National Technical University of Athens in 1990, where she subsequently remained for a further period as a Research Assistant. Following this she joined Imperial College in 1992 where she studied for a PhD in Chemical Engineering specialising in Multiphase Flows. Prof Angeli joined the Department of Chemical Engineering at UCL in February 1996. In 1998 she received an Esso Fellowship Award and in 2011 she was awarded a Leverhulme/RAEng Senior Research Fellowship to study intensified extractors for uranium separations. Prof. Angeli's research is in the area of two-phase flows, where she is using advanced instrumentation and unique experimental approaches for the study of the complex multiphase flow environments, which lead to the development of predictive models. She is particularly interested in the flow of liquid-liquid mixtures relevant to oil flow assurance in large pipelines and the flow and mass transfer characteristics of two-phase liquid-liquid and gas-liquid reaction and separation systems in intensified and small scale units. Prof Angeli has published over 100 research papers, co- authored 3 book chapters and is a guest editor of the Nuclear Process Engineering Special Issue by the Chem. Eng. Res. Design Journal. She was invited as Visiting Professor for Multiphase Flows in A*Institute of High Performance Computing, Singapore and is participating in the research funding panels of the UK Engineering and Physical Sciences Research Council and the Norwegian Research Council.

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