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ΣΕΜΙΝΑΡΙΟ

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ΟΜΙΛΗΤΡΙΑ: **Βαρβάρα Συγγούνη**, Μεταδιδακτορική Συνεργάτις Εργαστηρίου Φαινομένων Μεταφοράς και Φυσικοχημικής Υδροδυναμικής
Τμήμα Χημικών Μηχανικών, Πανεπιστήμιο Πατρών

ΘΕΜΑ: **Διερεύνηση διεργασιών ροής και φυσικοχημικών διεργασιών σε πορώδη υλικά**

Investigation of Flow and Physicochemical Processes in Porous Materials

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ITE/IEXMH

ΗΜΕΡΟΜΗΝΙΑ: **Τετάρτη, 28 Ιουνίου 2017**

ΩΡΑ: **16:30**

ΠΕΡΙΛΗΨΗ

Towards the quantification of porous media wettability: Most of the natural and artificial porous media are mixed-wet. Fractional-wet porous media are of significant importance for numerous applications such as enhanced oil (EOR) and gas recovery from reservoirs rocks; CO_2 storage in depleted reservoirs and deep saline aquifers, subsurface and groundwater; separation of water-in-oil emulsions using coalescence fiber-filters; oxygen transport through the gas diffusion layers of polymer electrolyte membrane fuel cells; adhesion of blood cells on biomaterial surfaces etc. During my Ph.D. thesis, a new method for the quantification of porous materials wettability was developed. The parameters obtained from the wavelet analysis of the transient signals of the pre-breakthrough capillary pressure measured during displacement experiments in fractional-wet porous media, were correlated with the regional and frontal wettability.

Investigation of hysteretic phenomena during WAG processes: Water Alternating Gas (WAG) processes promise satisfying results in applications such as CO_2 storage in reservoir rocks, EOR or

soil remediation. During my Post-Doctoral research at IFP Energies Nouvelles, visualization experiments in micromodels were conducted under reservoir conditions, using dead oil and reconstituted brine. The effect of saturation history on the sweep efficiency and on the phase distribution in the pore space and the role of wettability were investigated. Flow experiments in a composite core have been conducted, 2-phase relative permeabilities were extracted through numerical simulation and the 3-phase relative permeabilities were used to build 3-phase relative permeability curves.

CO_2 leakage effects on biofilms: Potential CO_2 leakage from a storage geologic formation is a major concern. During my Post-Doctoral research at Civil Eng. Dept. (UPatras), the effect of CO_2 on biofilm formations of *Pseudomonas putida* in a glass-etched pore network micromodel was examined experimentally. Biofilm and gas saturations of the micromodel were determined by binary image analysis of the recorded snapshots. The work was extended to real cores.

Characterization of TiO_2 NP suspensions in aqueous solutions and NP retention in water-saturated columns packed with beads: Engineered metal oxide NPs have received considerable attention over the past few years due to their rapid large-scale production and frequent use in microelectronics, paints, catalysts, cosmetics, food, pharmaceutical industries, in environmental remediation applications, in EOR for altering the interfacial tension values or contact angles, in multiphase flow systems or applications concerning hydraulic fracturing. Large quantities of NPs are released into sewers, which eventually reach wastewater treatment facilities, or directly into surface waters and subsurface environment by numerous point and non-point sources, including wastewater reuse, agricultural uses, landfill leachates, and underground storage tank leakages. During my Post-Doctoral research at Civil Eng. Dept. UPatras, suspensions of TiO_2 NPs were characterized and their transport in columns packed with glass beads was investigated

Salt precipitation in porous media: Multiphase flow taking place during oil recovery or EOR, CO_2 or gas storage, several industrial applications, geothermal energy production and utilization and membrane filtration processes, is accompanied by interesting and complex physicochemical processes such as the deposition and growth of salts which mostly is encountered as an undesirable problem. In the frame of SPM 4420-Aristeia II at the Lab. of Transport Phenomena and Physicochemical Hydrodynamics (Chem. Eng. Dept. UPatras), the effect of the presence of water-miscible and water-immiscible organic solvents on salt precipitation were investigated. It was shown that the presence of organic solvents influence

strongly salt precipitation mechanisms and crystal growth. **For the future, it is planned to extend salt precipitation experiments in mixed-wet microchannels and beds.**

Characterization of muds selected from natural SPA resorts for pharmaceutics/cosmetics production: The physicochemical characterization of mud specimens from natural spa resorts was performed during Greece-Israel Bilateral Cooperation at the Lab. of Inorganic and Analytical Chemistry, Chemical Eng. Dept. UPatras. All muds were characterized concerning their mineralogical, chemical components as well as their morphological characteristics using appropriate methods (XRD, TGA, BET, SEM, EDS). Total phenolic concentration (TPC) in distilled water equilibrated with the mud specimens was measured as an index for their antioxidant properties. The use of additives on the stabilization of suspensions is under investigation.

ΣΥΝΤΟΜΟ ΒΙΟΓΡΑΦΙΚΟ

Dr. Varvara Sygouni holds a Chemical Engineer diploma (2002), a M.Sc. on "Simulation, Optimization and Control of Processes" (2005) and a Ph.D. (2007) (subject "A new method for the quantification of the fractional wettability of porous media through two-phase displacement experiments"), all obtained from Chemical Eng. Dept. University of Patras. Her M.Sc. and Ph.D. were supported by FORTH/ICE-HT under the 5th FP "Energy, Environment and Sustainable Development" and the 6th FP "Global change and ecosystems". She worked as Post-Doctoral Fellow at IFP Energies Nouvelles (REPSOL funding), at Civil Eng. Dept. UPatras and she managed the Interuniversity Network Biomet consisted of 8 Laboratories. On 2015 she became a Research Fellow at the Lab. of Transport Phenomena and Physicochemical Hydrodynamics in the frame of Aristeia II and at the Lab. of Inorganic and Analytical Chemistry in the frame of Greece-Israel Bilateral Cooperation Program (both laboratories of the Chemical Eng. Dept. UPatras). Her research interests are focused on multiphase flows and physicochemical phenomena taking place in porous materials extended also to include biofilms and nanoparticles. She has written and submitted research proposals, some of which have been succeeded and she was responsible for the delivering of a significant number of reports. She has been a full-time contract lecturer at Mechanical Eng. Dept. (TEI of Patras) for 3 years and currently she is a fixed-term lecturer at Dept. of Materials Science (UPatras). She has advised and co-advised a significant number of pre-graduate and graduate students. She has 18 publications in scientific journals, 24 in international scientific conferences and 14 in national conferences.