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TWO-PHASE FLOW IN INDUSTRIAL POROUS MEDIA: EXPERIMENTS, THEORY, AND MODELLING

Prof. S. Majid Hassanizadeh



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Various industrial systems involve two-phase flow in porous media, such as in fuel cells, filtration, paper, food, concrete, ceramics, moisture absorbents, and membranes. Commonly, models and concepts from soil and groundwater are adopted to model flow and transport in such porous media. However, industrial porous media are significantly different from soil and rock, and flow and transport processes occur in different regimes.

There is a clear need for revisiting theories and measurement techniques specifically applicable to industrial porous media. In this presentation, a number of examples of industrial porous media are given. Two industrial applications are discussed in detail: penetration of ink into paper and the distribution of liquids in diapers. We also discuss how the formulation of two-phase flow in such systems should be modified. In particular, we introduce a new approach called “Reduced Continua Approach” for modelling flow and transport across thin porous materials.

ABOUT THE SPEAKER

Prof. Hassanizadeh is a world authority on theoretical, experimental, and computational aspects of two-phase flow and contaminant transport in porous media. Also, he has performed experimental and computational studies of industrial and biological porous media (such as injection of chemo-drugs into brain, fuel cells, paper, diapers).

He is affiliated with Stuttgart University (Germany), Utrecht University (The Netherlands), KAUST University (Saudi Arabia), IIT Hyderabad (India), and Chongqing University (China). He has received many awards, including AGU Horton Medal, Royal Medal of Honor in the Netherlands, and honorary degree from Stuttgart University. He has been (associate) editor of many journals. In 2008, he cofounded the International Society for Porous Media (<https://www.interpore.org/>), and has served as its Managing Director ever since. See <https://www.uu.nl/medewerkers/SMHassanizadeh/CV>.