Pore-scale modelling of biofilm activity in the underground storage of hydrogen.

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ABSTRACT: The storage of hydrogen in the subsurface to compensate fluctuations in energy demand and supply is considered an important part of future energy strategies. It has been observed that, within the period of storage, there is a partial conversion of hydrogen in the presence of carbon dioxide to methane. This has been attributed to the activity of micro-organisms (archaea and bacteria) indigenous to the storage site.

The talk will look at pore-scale phenomena including the interplay of different microbes (methanogens, acetogens, and acetotrophs) within a biofilm at the gasð water interface, the growth and decay of the multi-species biofilm, and the diffusion, consumption, and production of the dissolved gases. A numerical model with interface tracking, based on a volume-of-fluid method, is proposed for investigating these effects.

The aim of the study is the description and quantification of the dominant processes which determine the amount of biomass such a reservoir can support and the rate at which the micro-organisms produce methane as a contribution to explaining the observed field-scale phenomenon.