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A multidisciplinary approach

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Scale formation studies: A multidisciplinary approach

Isaac A. Løge, Randi Neerup, Jakob R. Bentzon, Lucas F. F. Corrêa, Jiasheng Hao, Susana Almeida, Meng Shi, Benaiah U. Anabaraonye

Scale formation, i.e., crystallization fouling, presents a signification challenge in many industrial processes. It limits the performance of heat exchangers, reduces the performance of membranes in desalination processes, increases the production cost of water treatment processes, and is a major flow assurance challenge in the petroleum industry. In the oil and gas industry, along with corrosion, scaling is the most significant threat to well integrity. To plan effective mitigation processes, the development of accurate prediction models, capable of predicting both the location and magnitude of scale formation, are important. Such prediction models require an in-depth understanding of the thermodynamic, chemical kinetics, and hydrodynamic conditions of the system of interest.

This is an introduction to three studies, where we will introduce our multidisciplinary approach to unravelling the mechanisms at play in scale formation for $FeCO_3$ and $BaSO_4$. First, we present new solubility measurements at the high temperatures and pressures relevant to subsurface reservoirs. Next, we show the role of turbulence in scale formation kinetics by combining experiments and computational fluid dynamics (CFD) simulations. Finally, we show how the complex interplay between surface morphology and fluid hydrodynamics govern the location, and frequency, of attachment and detachment processes.

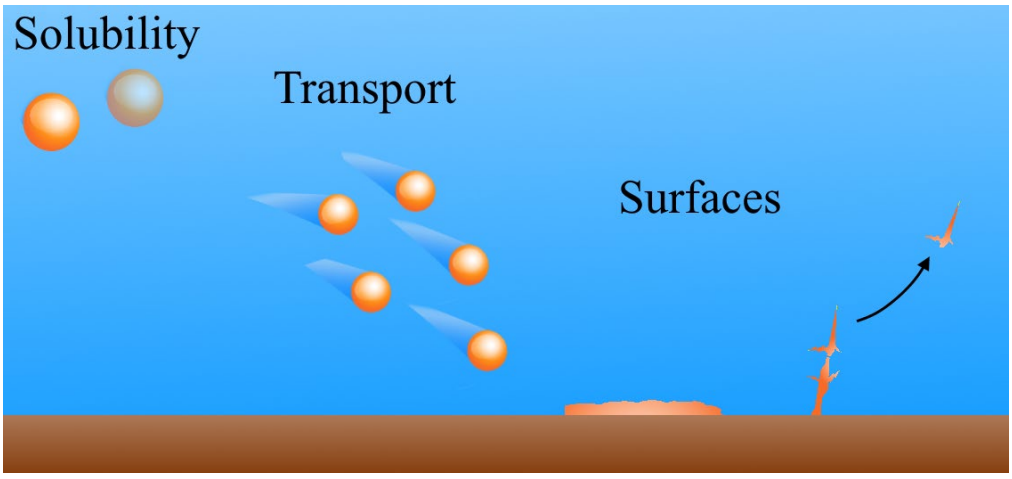

Figure 1: Overview of the complexity of scale formation..