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Prediction of Bio-Chemical Clogging in Geothermal Systems: From Surface to Reservoir

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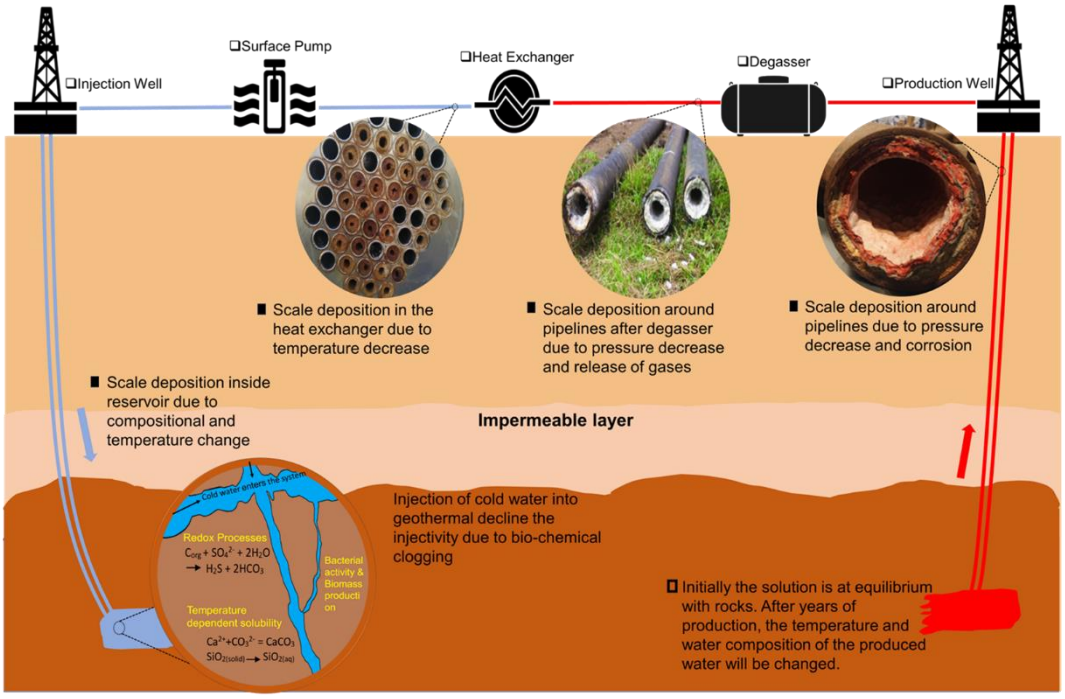
Geothermal reservoirs are a robust and reliable energy source with unique advantages. Beyond delivering high energy output, geothermal energy (GE) is cost-effective and requires minimal maintenance. Its applications are expanding across diverse sectors, including electricity generation, heating and cooling, agriculture, industry, and tourism. As Europe, especially Scandinavian countries, prioritizes the shift to a low-carbon economy, geothermal resources are expected to play a vital role in meeting urban energy demands and reducing reliance on fossil fuels. A key aspect of geothermal operations is the reinjection of produced water, which helps restore aquifer levels and mitigates environmental risks associated with discharge. However, efficiency can be hindered by clogging in the near-wellbore porous media, and scaling in borehole and surface facilities which can impact the injection process and overall system performance. This research focuses on identifying factors that contribute to the reduced efficiency of geothermal systems. To achieve this, the scaling potential in a geothermal system is assessed using PHREEQC geochemical software, accounting for factors like chemical composition, temperature, and pressure changes across surface facilities, wells, and reservoirs. Additionally, 1D pipe flow is analyzed with respect to turbulence effects to address pressure drops inside the well. This comprehensive model is foundational in developing a robust predictive design for geothermal systems, ultimately supporting a greener world for current and future generations.



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