CHEMOTAXIS MODELLING IN HEROGENEOUS POROUS MEDIA USING SMOOTHING PARTICLE HYDRODYNAMICS

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As recently shown in laboratory bench scale experiments, chemotaxis, i.e. the movement of microorganisms toward or away from the concentration gradient of a chemical specie, could have a fundamental role in the transport of bacteria through saturated porous media. We therefore develop a numerical model based on smoothing particle hydrodynamics (SPH) to simulate the chemotactic transport of bacteria in heterogeneous porous media under steady state flow conditions. We present a novel approach to take into account the chemotactic advective component of the bacteria transport equation in the more general SPH framework using the same set of particles for both bacteria and solute species.
The test cases show that this new numerical scheme is mass conservative and free of numerical dispersion, such that it can be used to accurately assess the nonlinear interplay between local dispersion and chemotaxis in porous formations.