

Diffusion with self-induced convection

R. Vodák

Faculty of Science, Palacký University Olomouc, Czech Republic
rostislav.vodak@gmail.com

Raw hide—the principal raw material in leather making industry—is usually conserved by salt before it is transported to tanneries. Salination (i.e. soaking in a water solution of salt) needs to be performed correctly to avoid damaging the material. The process of salination can be modeled by molecular diffusion of salt into the (water-saturated) inner pore-space of the hide. However, the concentrations involved are so high that the infiltration of salt into the hide induces a counter-flow of fresh water out of the material. This self-induced convection makes the mathematical modeling of the process non-trivial. In this talk, a one-dimensional model is presented. The system consists of two nonlinear PDEs for the velocity and concentration fields. Existence of a local-in-time strong solution is proved by means of the Schaefer Fixed Point Theorem applied to a three-fold approximation scheme. Finally, a minimum principle for the concentration field is derived.