# Uniqueness for a cross-diffusion system issuing from seawater intrusion problems

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ABSTRACT. This work is devoted to the mathematical analysis of the Cauchy problem for cross-diffusion systems without any assumption about its entropic structure. A global existence result of nonnegative solutions is obtained by applying a classical Schauder fixed point theorem. The proof is upgraded for enhancing the regularity of the solution, namely its gradient belongs to the space $L^r((0,T) \times \Omega)$ for some $r > 2$. To this aim, the Schauder's strategy is coupled with an extension of Meyers regularity result for linear parabolic equations. We show how this approach allows to prove the well-posedness of the problem using only assumptions prescribing and admissibility range for the *ratios* between the diffusion and cross-diffusion coefficients. Finally, the question of the maximal principle is also addressed, especially when source terms are incorporated in the equation in order to ensure the confinement of the solution.