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Numerical approximation of a sorption-coagulation equation *

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Abstract

The purpose of this talk is to present part of recent works on a sorption-coagulation equation [1]. Such equation applies to a class of water-soluble polymers that interact with metal ions. Among various possible fields of application, we find environmental science, where these polymers can be used to remove pollutant from aqueous solutions. Our objective here is to study the equation that accounts for the configurational density of polymers $f(t,p,r)$ at time t and configuration $(p,r) \in (0,+\infty)\times(0,1)$ where p stands for the size of the polymer and r the fraction of size occupied by metal ions. Briefly, the equation reads for all time $t>0$:

$$\partial_t f + \partial_r\left(\mathcal{V} f\right) = Q(f,f)\,,$$

where Q is the coagulation operator, $\mathcal{V} = k(p,r)u(t) - l(p,r)$ is the sorption rate and $u(t)$ is the concentration of free metal ions satisfying a constraint given by a balance of mass. After introducing the well-posedness of this problem, we focus on its discretization by an Euler explicit in time finite volume scheme in the spirit of [2, 3]. We will present the techniques used to prove a weak stability principle in L^1 for the sequence of approximations. Finally, a preliminary result for the a convergence will be given.

Key words: sorption coagulation equation, finite volume scheme, weak stability, convergence, existence of solutions.

Mathematics subject classifications: 65R20, 82C05, 35Q82, 35Q92

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