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The role of Swelling in Diffusion-Controlled Drug Release: a Lattice Monte Carlo Approach MAXIME IGNACIO, GARY W. SLATER, University of Ottawa — A common approach used to control drug release rate consists in encapsulating the drug molecules inside a hydrogel (a network of hydrophilic cross-linked polymers). Placed in aqueous media or under the action of an external stimuli, the hydrogel can swell. This phenomenon leads to a non-trivial relation between the swelling of the hydrogel matrix, the diffusion properties of the drug molecules and the performance of a drug delivery system. We propose to investigate this problem using a novel Lattice Monte Carlo approach. In our LMC scheme, both the diffusion coefficient of the drug molecules and the lattice step size evolve in time as the water penetrates inside the system. Due to the resulting time- and space-dependent diffusivity, there are different interpretations of the stochastic term in the relevant overdamped Langevin equation (i.e "Ito-Stratonovich dilemma"). First, we examine how each calculus changes the release properties of the system in both the swelling-controlled and the diffusion-controlled limits. Second, we discuss the validity of the empirical mathematic models often used to fit the release data.

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