Sorption - Desorption process and Diffusion

Ervin K. Lenzi, Mauricio A. Ribeiro
Universidade Estadual de Ponta Grossa

Maria E. K. Fuziki
Universidade Tecnológica Federal do Paraná

The sorption - desorption processes of a substance by a structure depends on the properties of the surfaces and it can be strongly affected by diffusion and transport processes which are present in the bulk. Their description and the understanding of coupling among them is a challenge due to the large number of conditions which can be present in these systems. The ubiquity of these phenomena, in several fields of science, it has motivated several researchers to develop mathematical models in order to obtain suitable explanations. For this, some approaches have been extended by incorporating nonlinear terms and/or differential operators of non-integer order to account different effects which are not present in the standard approaches such as memory effects, long range correlations, geometric constrains, and fractal or multifractal properties. Here, we analyze a one dimensional system with the processes on the surfaces (sorption - desorption) governed by the Langmuir kinetics and fractional diffusion equations in the bulk. The solution is obtained analytically by using the Green function approach and/or numerically by considering different situations in order to evaluate the effects of the diffusion on the processes on the surface. We first consider the system in a finite interval and after extending it to semi-infinity interval. In both scenarios, we obtain a rich class of behaviors which may be related to anomalous diffusion.