Mathematical models for fixed-bed adsorption columns

In this talk mathematical models for contaminated fluids flowing through continuous fixed-bed adsorption columns will be described. In particular we shall derive a one dimensional advectiondiffusion equation coupled to a sink term that accounts for the contaminant adsorption. There exist in the literature a collection of different models for the adsorption terms whose particular choice is many times based on simplicity arguments or performing partial data fitting. Instead, we propose a model for the adsorption mechanisms that is purely based on the structure of the chemical reaction. This gives place to a nonlinear equation for the adsorption rate. By applying a travelling wave substitution the governing equations are reduced to two coupled ordinary differential equations whose dynamics is investigated. The travelling wave solutions are verified against the numerical resolution of the whole system of partial differential equations as well as with experimental data.