DETERMINISTIC AND STOCHASTIC MULTISCALE PROBLEMS ARISING FROM NANOSCALE SENSORS

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Abstract. Deterministic and stochastic multiscale problems occur in the mathematical modeling and simulation of nanotechnological devices in a natural manner. An overview of our recent results [1–12] in the solution of multiscale problems arising from the modeling and simulation of nanowire sensors is given here.

The applications here are nanowire bio- and gas sensors, where the multiscale problems stem from the different length scales of the molecules to be detected and of the whole nanowire transducer. The multiscale problems include both deterministic and stochastic ones. The main model equations are the Poisson equation, the nonlinear Poisson-Boltzmann equation, and systems of equations describing self-consistent charge transport such as the drift-diffusion-Poisson system and the Boltzmann-Poisson system. Existence and uniqueness of the solution as well as numerical methods are discussed.

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