In this paper we present a multiscale simulation of charge transport in a solid-state dye-sensitized solar cell, where the real morphology between TiO2 and the hole transport material is included. The geometry of the interface is obtained from an electron tomography measurement and imported in a simulation software. Charge distribution, electric field and current densities are computed using the drift-diffusion model. We use this approach to investigate the electrostatic effect of trap states at the interface between the electron and hole transport materials. The simulations show that when the trapped electrons are not screened by external additives, the dynamics of holes is perturbed. Holes accumulate at the interface, enhancing recombination and reducing cell performance.