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ROBIN-TYPE BOUNDARY CONDITIONS IN TRANSITION FROM REACTION-DIFFUSION EQUATIONS IN 3D DOMAINS TO EQUATIONS IN 2D DOMAINS

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ABSTRACT

We consider a singular limit of reaction-diffusion equations in 3D domains of thickness converging to zero.

In the 2D limit the resulting reaction-diffusion equation has a source term resulting from the Robin-type boundary conditions imposed on boundaries of the original 3D domain. The proposed approach can be applied to constructing approximate solutions of diffusion problems in thin planar, cylindrical, or spherical layers between two membranes. As an example we refer to the problem of activation of B lymphocytes, which typically have large nuclei and a thin cytoplasmic layer which can be considered as a spherical shell.