Homogenization of a class of elliptic problems with nonlinear boundary conditions in domains with small holes

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Abstract.
We consider a class of second order elliptic problems in a domain of $\mathbb{R}^N$, $N > 2$, $\varepsilon$-periodically perforated by holes of size $r(\varepsilon)$, with $r(\varepsilon)/\varepsilon \to 0$ as $\varepsilon \to 0$. A nonlinear Robin-type condition is prescribed on the boundary of some holes while on the boundary of the others as well as on the external boundary of the domain, a Dirichlet condition is imposed. We are interested in the asymptotic behavior of the solutions as $\varepsilon \to 0$. We use the periodic unfolding method introduced in [Cioranescu, D., Damlamian, A. and Griso, G., Periodic unfolding and homogenization, C. R. Acad. Sci. Paris, Ser. I, 335 (2002), 99–104]. The method allows us to consider second order operators with highly oscillating coefficients and so, to generalize the results of [Cioranescu, D., Donato, P. and Zaki, R., Asymptotic behavior of elliptic problems in perforated domains with nonlinear boundary conditions, Asymptot. Anal., Vol. 53 (2007), No. 4, 209–235].

References

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