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# Asymptotic Analysis of a Quasilinear Elliptic Problem with Different Boundary Multi-Phase Interactions in a Perforated Domain

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Let  $\Omega_\varepsilon$  be a domain that is  $\varepsilon$ -periodically perforated by small holes with diameter of order  $\mathcal{O}(\varepsilon)$ . The holes are divided into three  $\varepsilon$ -periodical sets depending on the boundary interactions given at their surfaces. In  $\Omega_\varepsilon$  we consider a quasilinear elliptic problem with given the nonuniform Neumann conditions, the quasilinear boundary conditions and the uniform Dirichlet conditions on the boundaries of the holes from these sets respectively.

We construct the leading terms of the asymptotics and prove the asymptotic estimate for the difference between the solution and the corrector in the Sobolev space  $H^1(\Omega_\varepsilon)$ .

In the linear case we construct and justify the complete asymptotic expansion for the corresponding solution.

These results were obtained jointly with T.A. Mel'nyk.