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The L^p Robin problem of Laplace equations in Lipschitz domains

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Abstract. Let $n \geq 3$ and Ω be a bounded Lipschitz domain in $\mathbb{R}^n$. Assume that $p \in (2, \infty)$ and the function $b \in L^\infty(\partial\Omega)$ is non-negative, where $\partial\Omega$ denotes the boundary of Ω. Denote by ν the outward unit normal to $\partial\Omega$. In this talk, we give two necessary and sufficient conditions for the unique solvability of the Robin problem for the Laplace equation $\Delta u = 0$ in Ω with boundary data $\partial u/\partial\nu + bu = f \in L^p(\partial\Omega)$, respectively, in terms of a weak reverse Hölder inequality with exponent p or the unique solvability of the Robin problem with boundary data in some weighted $L^2(\partial\Omega)$ space. As applications, for any $p \in (1, \infty)$, we obtain the unique solvability of the Robin problem for the Laplace equation in the bounded (semi-)convex domain Ω with boundary data in (weighted) $L^p(\partial\Omega)$. This talk is based on the joint work with Profs. Dachun Yang and Wen Yuan.