

On semi-linear elliptic equation arising from Micro-Electromechanical Systems with contacting elastic membrane

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Abstract: This paper is concerned with the nonlinear elliptic problem $-\Delta u = \frac{\lambda}{(a-u)^2}$ on a bounded domain Ω of \mathbb{R}^N with Dirichlet boundary conditions. This problem arises from Micro-Electromechanical Systems devices in the case that the elastic membrane contacts the ground plate on the boundary. We analyze the properties of minimal solutions to this equation when $\lambda > 0$ and the function $a : \bar{\Omega} \rightarrow [0, 1]$ satisfying $a(x) \geq \kappa \text{dist}(x, \partial\Omega)^\gamma$ for some $\kappa > 0$ and $\gamma \in (0, 1)$. Our results show how the boundary decay of the membrane works on the solutions and pull-in voltage λ .

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