An optimization problem in thermal insulation

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We study thermal insulating of a bounded body. Under a prescribed heat source, we consider a model of heat transfer between the body and the environment determined by convection; this corresponds, before insulation, to Robin boundary conditions. We study the maximization of heat content (which measures the goodness of the insulation) among all the possible distributions of insulating material with fixed mass, and prove an optimal upper bound in terms of geometric properties. Eventually we prove a conjecture which states that the ball surrounded by a uniform distribution of insulating material maximizes the heat content.