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Xin Yang* (yangxin1@msu.edu), 3313 Trappers Cove Trail, Apt 2D, Lansing, MI 48910. *Blow-up problems for the heat equation with a local nonlinear Neumann boundary condition.*

This paper estimates the blow-up time for the heat equation $u_t = \Delta u$ with a local nonlinear Neumann boundary condition: The normal derivative $\partial u/\partial n = u^q$ on Γ_1 , one piece of the boundary, while on the rest part of the boundary, $\partial u/\partial n = 0$. The motivation of the study is the partial damage to the insulation on the surface of space shuttles caused by high speed flying subjects. We will prove the finite time blow-up of the solution and estimate both upper and lower bounds of the blow-up time in terms of the area of Γ_1 . In many other works, they need the convexity of the domain Ω and only consider the problem with $\Gamma_1 = \partial\Omega$. In this paper, we remove the convexity condition and in addition, we deal with the local nonlinearity, namely Γ_1 can be just part of $\partial\Omega$. (Received June 07, 2016)