1108-35-43 **Xin Yang*** (`xinyangmath@gmail.com`), C529, Wells Hall, 619 Red Cedar Road, East Lansing, MI 48824, and **Zhengfang Zhou**. *The blow up problem for the heat equation with piecewise continuous nonlinear Neumann boundary condition.* Preliminary report.

We will study the following heat equation with nonlinear piecewise boundary value problem:

$$
\begin{cases}
u_t(x,t) = \Delta u(x,t) & \text{in} \quad \Omega \times (0,T] \\
\frac{\partial u}{\partial n}(x,t) = u^p(x,t) & \text{on} \quad \Gamma \times (0,T] \\
\frac{\partial u}{\partial n}(x,t) = 0 & \text{on} \quad (\partial\Omega \setminus \Gamma) \times (0,T] \\
u(x,0) = u_0(x) & \text{in} \quad \Omega
\end{cases}
\tag{1}
$$

where $p > 1$, $u_0(x) \geq 0$, Ω is a bounded open set in $\mathbb{R}^n$ with $\partial\Omega \in C^{1+\alpha}$, Γ is a connected part of $\partial\Omega$ with positive measure. The problem is motivated by partial damage to insulation of high speed flying subjects. We prove the local existence, uniqueness and comparison principle of the solutions in a suitable space. After that, we prove that the solution must blow up in finite time. And the blow up time is estimated by the measure of Γ and the size of initial data. (Received January 15, 2015)