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TOTAL VERSUS SINGLE POINT BLOW-UP FOR A NONLOCAL GASEOUS IGNITION MODEL

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ABSTRACT. In this paper we investigate an integro-parabolic equation that may be considered as a mathematical model for the temperature within the ignition period of a gaseous fuel. For radially symmetric, non-increasing initial data, we determine where classical solutions become unbounded in finite time as well as describe the asymptotic behavior of these hot-spots. The method of analysis is based on maximum principle techniques and the method of stationary states.

1. Introduction.

1.1 Statement of the problem: Gaseous ignition models. The thermal combustion process in a solid fuel, where heat transfer by conduction is constant and the reaction rate depends on temperature, can be modeled [**4**] by the semi-linear parabolic equation

$$u_t = \Delta u + f(u),$$

where typically $f(u)$ is either $\exp(u)$ or u^p with $p > 1$.

For an ideal gaseous fuel in a bounded container, the motion caused by the compressibility of the gas leads to the addition of a *nonlocal* integral term that complicates the model. For example, the ignition period of a thermal event can be described by the following integro-

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