Abstract: In this paper, we study the global existence and time-asymptotic behavior of solutions for a model system of the radiating gas with large initial data. First of all, we prove the blow up of classical solutions to the Cauchy problem. Secondly, we obtain the global existence of the solutions when the initial data u_0 satisfies the smallness conditions for $\|\nabla u_0\|_{H^s}$, but not for $\|u_0\|_{L^2}$. Finally, the optimal decay rates of the solutions are shown.