

# SMOKE

- Smoke is a collection of airborne solid and liquid particulates and gases emitted when a material undergoes combustion or pyrolysis.
- Smoke shape follows the standard convection-diffusion equation:  
$$\frac{\partial C}{\partial t} + \vec{u} \cdot \nabla C = D \nabla^2 C$$

where  $C$  is the smoke concentration and  $D$  is the diffusion coefficient of smoke.
- Smoke coming from a candle has a higher temperature than the surrounding, giving it lower density, which makes it rise. As it rises, it cools down, which also decreases the net force on the smoke particle. At the same time hotter smoke from below hits the smoke that is more stagnant causing random movements.

# FLAMES

- A flame is the visible, gaseous part of a fire. It is caused by a highly exothermic reaction taking place in a thin zone.
- Flame color depends on several factors, the most important typically being black-body radiation and spectral band emission, with both spectral line emission and spectral line absorption playing smaller roles. In the most common type of flame, hydrocarbon flames, the most important factor determining color is oxygen supply and the extent of fuel-oxygen pre-mixing, which determines the rate of combustion and thus the temperature and reaction paths, thereby producing different color hues.