

---

# **Fire Dynamics**

## **Self ignition**

Haejun Park



# Objectives

---

- Understanding self-ignition phenomena

# Self ignition?

---

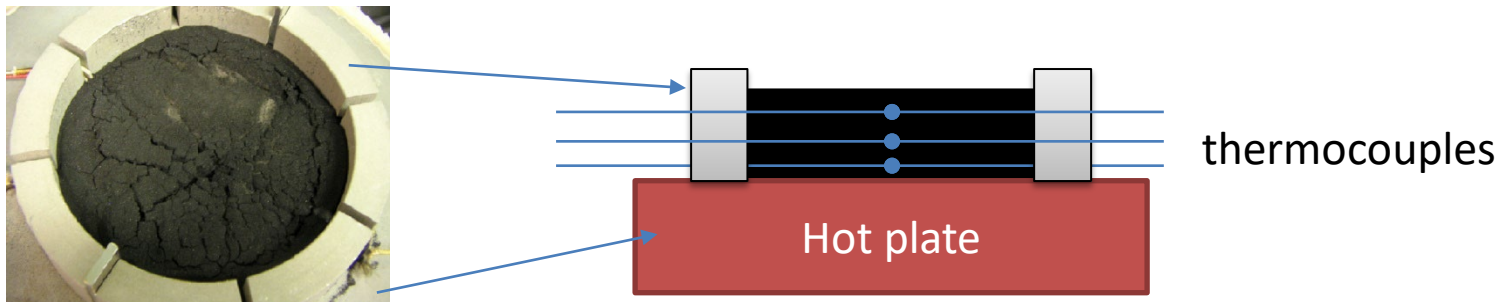
- Self-ignition
- Spontaneous combustion
- Thermal runaway
- <https://www.youtube.com/watch?v=9yq6VW-c2Ts>
- <https://www.youtube.com/watch?v=ZA7UdP9V4y8>

# When self ignition occurs?

- **Heat generation rate > heat loss rate**
- Heat generation rate:  $\rho C \frac{\partial T}{\partial t} = k \frac{\partial^2 T}{\partial x^2} + \rho Q A e^{-E/RT}$
- Heat loss rate:  $-k \frac{dT}{dx} = h_t (T_s - T_a)$

# When self ignition occurs?

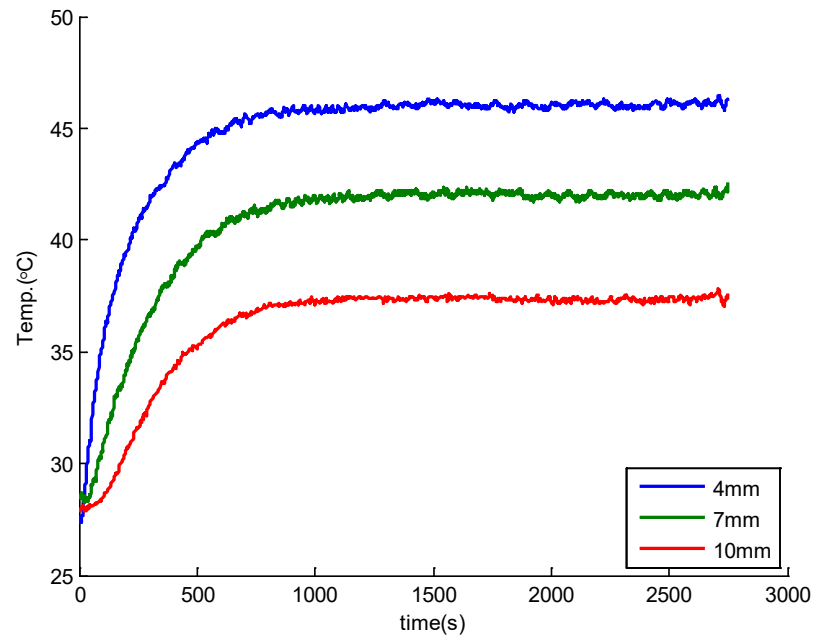
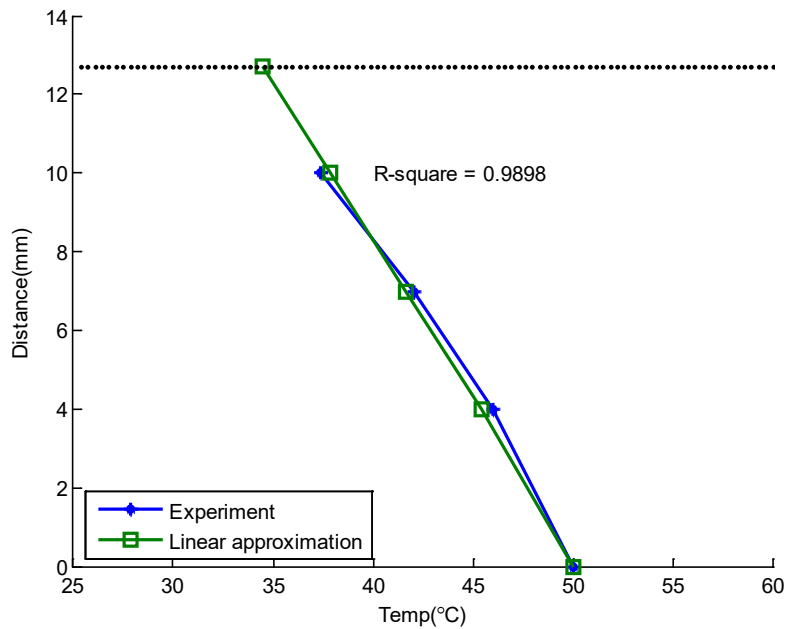
- A 12.5 mm thick coal dust layer on a hot plate



- Temp. profile when hot plate Temp. = :
  - 50 °C ?
  - 210 °C ?
  - 215 °C ?

# When self ignition occurs?

- At 50 °C



- At 210 °C and 215 °C

