

Droplet evaporation



droplets \rightarrow Surface Area.
 \downarrow
droplets to evaporate.
fine droplets evaporate fast.

Scramjet Engine

$M = 2$ @ 1000 K

$a = 580\text{ m/s}$

$\rightarrow 1160\text{ m/s}$

10 m as Combustion Chamber length

10 ms

Evaporation is the slowest process

$$\text{Evaporation time } t_v = \frac{\rho_l d_0^2}{8(k_g/c_{pg}) \ln(1+B_v)}$$

$\rho_l \rightarrow$ density of liquid

$d_0 \rightarrow$ initial dia of the droplet.

$k_g, c_{pg} \rightarrow$ Thermal Conductivity & Specific heat.

$B_v \rightarrow$ Transfer no. for evaporation.

Evaporation time $t_v = \frac{d_0^2}{C}$ \rightarrow Combustion temp.

$$B_v = \frac{c_{pg}(T_c - T_b)}{c_{pl}(T_b - T_o) + L}$$

Specific heat
of liquid

boiling
temp at
that Pressure

initial
temp. of
liquid

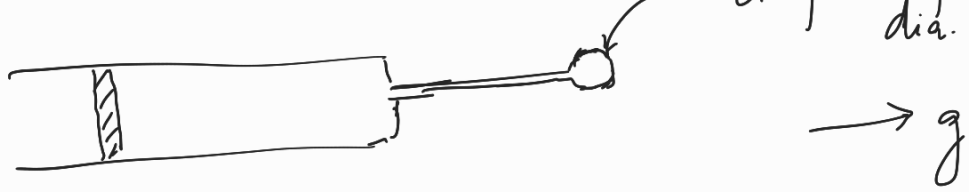
latent heat
of vaporization

In the experiments.

Ethyl. Acetate \rightarrow low boiling pt

Petrol \rightarrow higher boiling pt

droplet of known



Quiescent atmosphere.