which gives:

$$\frac{dm}{dt}=cr^2\left(\frac{8\pi}{R}\right)^{1/2}\left[\frac{P_G}{T_G^{1/2}}-\frac{P_L}{T_L^{1/2}}\right] \qquad (A10)$$

since $m=4\rho_w/3\pi r^3$ this may be written:

$$\frac{dr}{dx}=\frac{2}{3}\frac{1}{\pi u\rho_w}\cdot\frac{Kn}{\left(1+\frac{2.7\,Kn}{c}\right)}\left(\frac{8\pi}{R}\right)^{1/2}\left[\frac{P_G}{T_G^{1/2}}-\frac{P_L}{T_L^{1/2}}\right] \qquad (A11)$$

To solve equation (A11) c is taken as 1.0, R for steam as 461.5 J/kg K; $P_G \simeq P_L \sim P_S$, the saturation pressure; $T_L=T_S$, the saturation temperature and $\rho_w=1000\ \text{kg/m}^3$. Inserting these values, Eq (A11) reduces to

$$\frac{dr}{dx}=\frac{5.0\,Kn\,P_S}{u(1+2.7\,Kn)}\left[\frac{1}{T_G^{1/2}}-\frac{1}{T_S^{1/2}}\right] \qquad (A12)$$

Appendix 4. Diffusion and thermophoresis

For coupled diffusion and thermophoresis in the turbulent boundary layer the deposition equation is:

$$cV_N=(\varepsilon+D)\frac{dc}{dy}+cV_T \qquad (A13)$$

For the laminar boundary layer ε is set equal to zero in equation (A13). The molecular diffusion coefficient D is given by:

$$\left.\begin{aligned} &D=\frac{K_bT}{f}\\ &\text{where}\\ &f=\frac{6\pi r\mu}{F}\end{aligned}\right\} \qquad (A14)$$

The Boltzmann constant $K_b=R_u/A=1.381\times10^{-23}$ J/K where R_u is the universal gas constant, A is the Avogadro number $=6.033\times10^{23}$, f^{-1} is the particle mobility and F is the Cunningham correction. The form of F here used is due to Annis *et al*[22]:

$$F=1+Kn[1.558+0.173\exp(-0.769/Kn)] \qquad (A15)$$

The eddy diffusivity of the droplet, ε, was taken to equal that of the steam, an acceptable assumption for small droplets. In contrast to previous studies where the boundary sublayer only was treated[3,4,23] we have employed here the Van Driest[24] model to find the value of ε throughout the entire boundary layer:

$$\varepsilon=l^2\left|\frac{du}{dy}\right| \qquad (A16)$$

where

$$\left.\begin{aligned} &l=0.4y[1-F_d]\\ &\text{and}\\ &F_d=\exp^{-1}(y^+/26)\end{aligned}\right\} \qquad (A17)$$

For thermophoresis an expression due to Talbot *et al*[25] may be used over the whole range of Knudsen number:

$$V_T=-\frac{2C_S\nu\left(\frac{K_G}{K_p}+C_t\frac{l}{r}\right)\left[1+\frac{l}{r}\left[A+B\exp\left(-\frac{Cr}{l}\right)\right]\right]\left(\frac{dT}{dy}\right)_x}{\left(1+3C_m\frac{l}{r}\right)\left(1+2\frac{K_G}{K_p}+2C_t\frac{l}{r}\right)T_{av}}$$

where $C_S=1.14$, $C_t=2.18$, $C_m=1.14$, $C=0.88$, $A=1.2$, $B=0.41$ and $K_G/K_p=0.03$.

BOOK REVIEWS

Combustion in Engineering

These two volumes are a collection of 37 research papers presented at an international conference organised by the Institution of Mechanical Engineers, and attended by some 130 delegates from many different countries, at Keble College, Oxford in April 1983. The volumes are A4 size, 'paper-back' form, and although the type-face differs from paper to paper the format is consistent and the general appearance is uniform.

Taken together, the volumes are intended to provide 'a comprehensive up-to-date review of combustion in engineering'. There is certainly a wide variety of topics covered (perhaps too wide for any one person to have a specific interest in more than a small proportion of the papers) as would be expected from so wide a subject. It is debatable, however, whether a cohesive and complete 'state-of-the-art' picture can be built up in this manner.

Each of the volumes is also considered to be 'complete in itself' though it is unlikely that a potential buyer would want half of a complete story and the topics covered in the two volumes do inevitably overlap to some extent. Individuals, one would expect, would also be less likely to buy a collection of widely ranging papers (at £25) than, say, the library or reference section of a university or an automotive or power industry concern.

Volume 1 consists of twenty papers (200 pages) taken from the first half of the conference in which the topics covered included instrumentation and diagnostic techniques, ignition mechanisms, mathematical modelling and turbulence in combustion in both engines and rigs. Volume II contains the remaining papers (164 pages) of the second half of the conference and topics included are internal combustion engines and gas turbines, fuels, and combustion in furnaces.

The papers are, in general, clearly presented with diagrams and graphs appearing at the end of each paper and with standard units used (almost) throughout. Since the papers were prepared for the conference delegates, the discussions which took place after each session are unfortunately absent.

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