Errata

In the article titled "Horizontal Drying Fronts During Solvent Evaporation from Latex Films" by Alexander F. Routh and William B. Russel (pp. 2088-2098, September 1998), the authors require the following errata: We examine the drying of latex films and show how a front of close packed particles propagates through a drying film starting at an edge. Through this packed portion of the film, the the fluid-phase pressure decreases from zero at the position of the particle front, to a minimum value at the edge of the film.

A finite maximum capillary pressure shows the propagation of the front by allowing the solvent to recede into the film, once the maximum negative pressure is reached at the edge of the film. To quantify this, we assume that the receding water front is vertical. For this to be true, the pressure at the position of the water front must equal the maximum capillary pressure. Although, for it to move, the pressure gradient must be negative, implying that the pressure at some point from the front passes through a minimum, with a value lower than the minimum value allowed. This leads to the conclusion that the water front cannot be vertical. Instead, a stagnant region exists at the edge of the film, within which the water level recedes into the film, due to continued evaporation, while the pressure remains at the maximum capillary pressure. This is in contradiction to our previous analysis from Eq. 49 onward. We signify the position of this stagnant region by $\bar{x}_s$, as shown in Figure 1a.

Equation 49 is no longer useful since no horizontal flow exists in the stagnant region, and the height of the water layer merely decreases due to evaporation. Equations 50 and 51 still apply in the packed region where the pressure is no longer at its minimum value. Equation 52 for the pressure distribution in the packed region should read

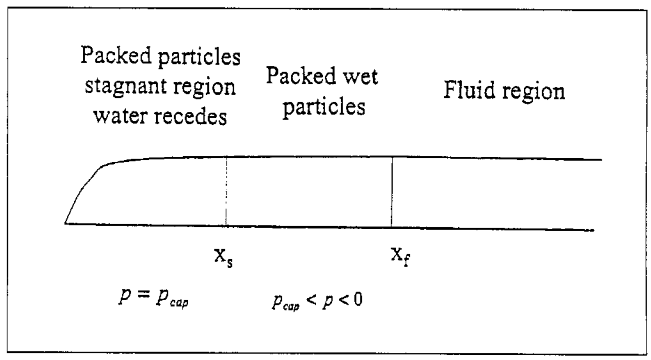

Figure 1. Three regions in drying film.

$$\bar{p} = \bar{p}_{cap} + \frac{1}{(1-\phi_m)} \int_{\bar{x}_s}^{\bar{x}} \frac{\bar{x}' - \bar{x}_s}{\bar{h}} d\bar{x}' \qquad (52)$$

with the position $\bar{x}_s$ determined such that $\bar{p}(\bar{x}_f) = 0$. Equation 53 no longer applies and the expression for the water velocity at the position of the particle front (Eq. 54) should read

$$\bar{u}_x(\bar{x}_f) = -\frac{\bar{x}_f - \bar{x}_s}{\bar{h}(\bar{x}_f)(1-\phi_m)} \qquad (54)$$

With these new equations, we examine the effect of the maximum capillary pressure, as before. Figure 6 is re-plotted, and we see the effect of the error is small. For Figure 7, the water front no longer applies, and the progression of the par-

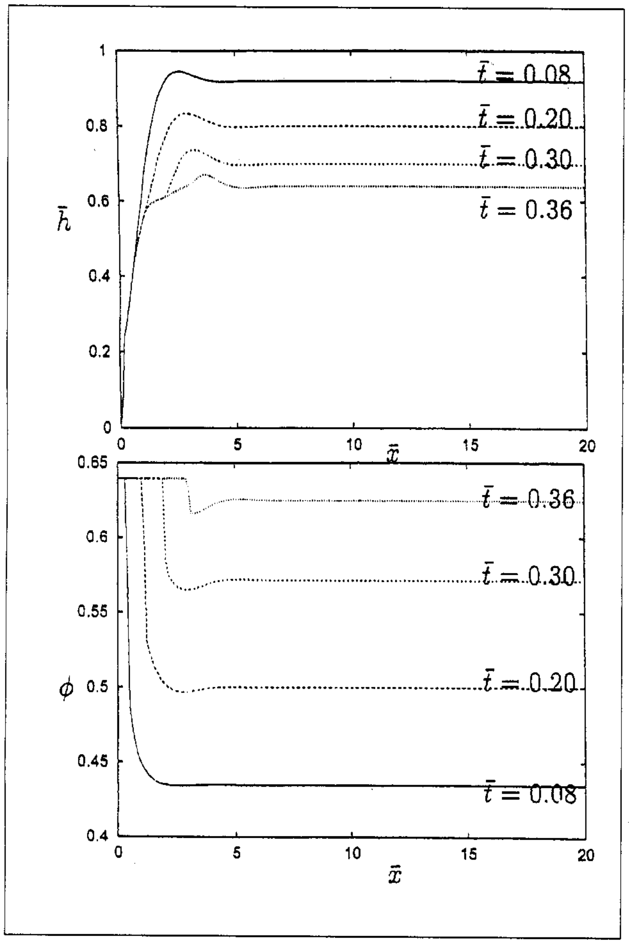

Figure 6. Evolution of height and volume fraction with time with $p_{cap} = 1.17$.

ticle front is adsorbed into a corrected Figure 8. The final recession of the water front in Figure 9 is no longer meaningful, although the open time calculation in Figure 10 remains the same since this reflects the time that that maximum capillary pressure is reached at the edge of the film.

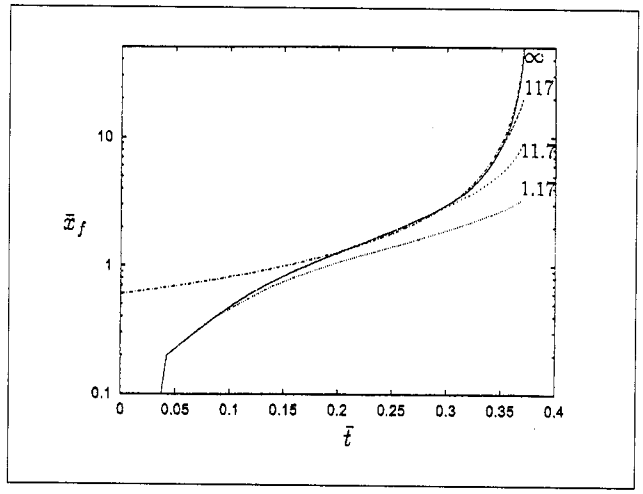

Figure 8. Evolution of particle front with different dimensionless capillary pressures.

Line starting at non-zero value is the long time approximation for $\bar{p}_{cap} = \infty$.