



**Figure 15.4** Effect of particle size on release rate. Release rates of decane from two Microsponge systems of different particle size: 1.47%/min (25  $\mu$ m, squares) and 1.81%/min (300  $\mu$ m, circles).

### B. Pore Diameter and Volume

Pore volume (void volume) determines the amount of active ingredient that can be entrapped within the microsphere. Conversely, pore diameter can have a significant effect on the rate of release of the ingredient. Figure 5 demonstrates the effect of pore diameter on the volatilization rate of menthol. Both pore volume and diameter are vital in controlling the intensity and duration of effectiveness of the active ingredient. Pore diameter also affects the migration of the active ingredient from the Microsponge into the vehicle in which the material is dispersed. As a result, the diameter of the pores can have direct impact on the stability of the final formulation.

### C. Resiliency

By altering the degree of monomer cross-linking at the time of polymerization, resiliency (viscoelastic properties) of the microsphere can be modified to produce a beadlet that is softer or firmer according to the needs of the final formulation. Cross-linking in excess of 10% is efficient in most systems. This allows sufficient strength for the Microsponge to retain its shape after some or all of the ac-