



Figure 13.10 Relative metal fluxes and substrate temperature for different coevaporation processes. In all cases, a constant Se flux is also supplied

been successfully implemented. Direct flux measurement may be critical in a manufacturing scale process, particularly if source depletion over long run times causes the relation between source temperature and effusion rate to vary over time. In addition, the process can be monitored by *in situ* film thickness measurement using a quartz crystal monitor, or optical spectroscopy or X-ray fluorescence of the growing film [83]. The latter has also been used to measure composition. When the process includes a transition from Cu-rich to Cu-poor composition near the end of the deposition, it can be monitored by a change