187h Characterization of Mechanical Property Variations in Pressure Sensitive Adhesive Films Using Quasi-Static and Dynamic Nanoindentation

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Characterization results using scanning probe microscopy (SPM) methods from several pressure sensitive adhesive (PSA) films and laminates are described. Three types of commercial PSAs were studied including a thermoplastic or hot-melt, a hot-melt reactive and an emulsion-based acrylic. In applications, PSA is utilized as viscoelastic, thin films commonly less than 25 μm thick with moduli on the order of 10^5 Pa or less. As such, they present a serious characterization challenge. Here, the use of nanoindentation as well as atomic force microscopy and scanning electron microscopy to characterize PSAs and PSA constructions are discussed. The results demonstrate that SPM techniques can provide valuable information on the variation of mechanical properties in the thickness direction of adhesive films, the depth of penetration into porous substrates, and the variation in adhesion in the vicinity of processing induced defects. In addition nanoindentation provides a means for characterizing the dynamic mechanical properties of emulsion PSAs, which are cast as thin films effectively preventing their characterization using conventional rheometers.