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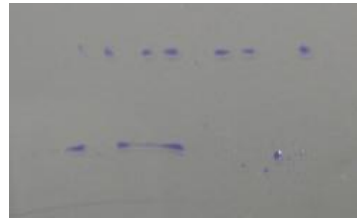
Problems with Dyne Pen Measurements on Polycarbonate

Introduction

Dyne level, an approximation of surface energy, is often used to assess printability or bondability. However, dyne level measurements on polycarbonate film and sheet have been found to have limited reproducibility, so great caution must be exercised when using these values. Dyne pens are an inexpensive and simple way to assess dyne level. They are available as a set of magic marker style pens. Each pen has a different fluid defining a dyne level and is used to determine the wetting point of the substrate by marking it with a line. Any beading or narrowing of the wetted area is considered dewetting, therefore the dyne level of the fluid is considered to be higher than that of the substrate.



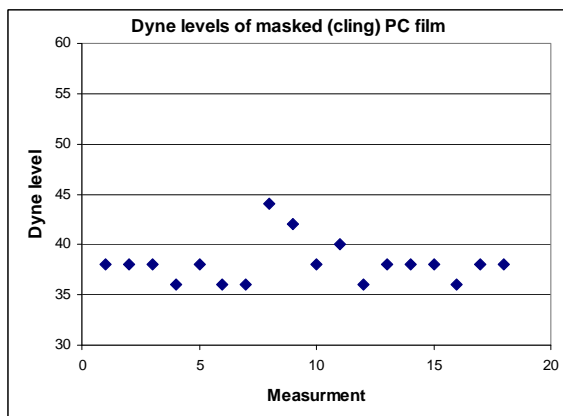
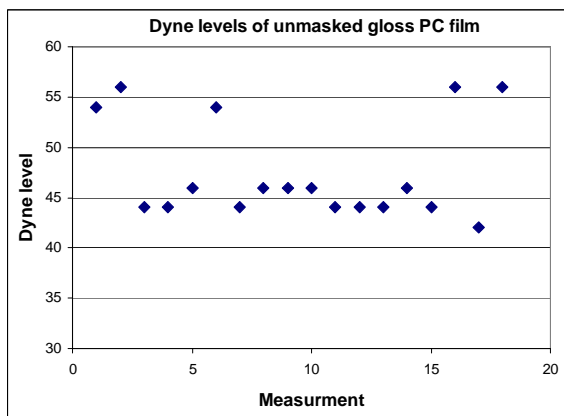
Dyne fluid wetting substrate



Dyne fluid dewetting substrate

Dyne Levels of Polycarbonate Sheet and Film

The graphs below depict actual dyne level test results for gloss polycarbonate film with and without masking, produced and tested over a two week period. The dyne levels range from 42 to 56 and 36 to 44, respectively. Dyne level results for masked and unmasked polycarbonate sheet have shown similar values and variances.



* Similar variations have been found for stick masking

These ranges show the lack of reproducibility of the dyne test, *not* the differences in the polycarbonate. Although more advanced measurement techniques are published, including ASTM D 5946, they seldom agree on a specific value for surface energy. Data sheets for polycarbonate products that include surface energy often list ranges of values. Typical published values for polycarbonate film and sheet range from 44 to 57.

Problems associated with using the dyne level measurement include: the variation in the application of the wetting fluid; subjectivity of the assessment of dewetting; potential contamination of the surface or pens; change in the pen fluid composition over time; variance in the surface electrical (static) charge; variance in the microscopic surface roughness; and dyne level measurements ignore the interaction energy of the fluid with the surface.

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