Mar Resistance of Polycarbonate

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Introduction

The scratch-testing option offered by Nanomechanics, Inc. has the capability of characterizing scratch hardness, mar resistance, coating adhesion, film delamination, failure modes, etc. We provide quantitative scratch results by measuring nanometers while moving millimeters. The scratch option is a valuable extension for iNano and iMicro users. The scratch option comes with a conical indenter (90°, R5μm) as well as a test method which automatically identifies the critical load for film failure.

Materials and Methods

A bulk sample of polycarbonate was subjected to scratch testing to quantify its mar resistance. The scratch test procedure included an initial profile of the scratch vector, a pre-scratch profile, a scratch proper, a post-scratch profile, a final profile and a cross profile. Over the scratch proper, the load was linearly increased to 5mN. A final profile was performed across the scratch to quantify scratch width and pile-up.

Results and Discussion

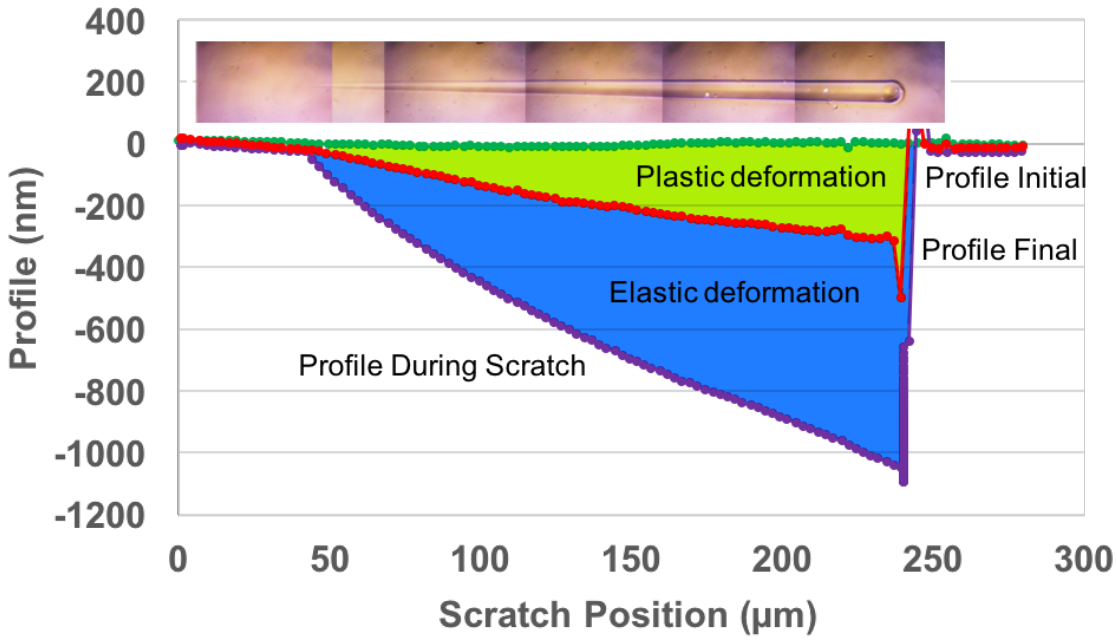

Figure 1 - Scratch curves for polycarbonate. The green trace is the original morphology scan, the red trace is the residual deformation, and the purple trace is the scratch cycle. The insert is the micrograph of the full scratch length. All profiling was done at 5μN.

The progressive-load scratch caused no dramatic changes in the mode of deformation. The scratch appeared smooth over its length, but gradually increases in width and depth. Figure 2 shows the results of the cross profile which revealed a scratch width of 4.7μm and a pile-up height of 72.1nm.

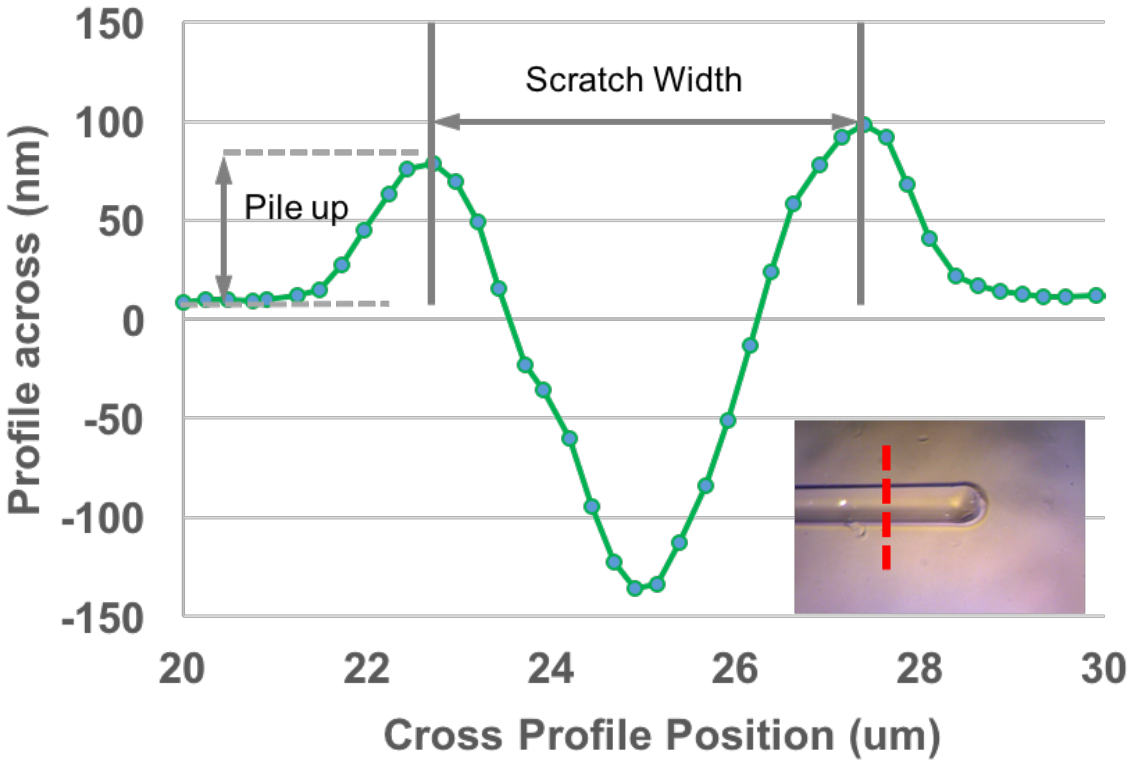

Figure 2 - Profile across the scratch groove. Scratch width is defined as the peak-to-peak distance perpendicular to the scratch length. The insert shows the scratch at the location of the cross profile.