The results here show correlation between UCTL stress crack failure times and the following physical measurements and tests: 1) poor resin in the textured layer, 2) low tensile break elongation results, and 3) inordinately high asperity height. These easily-measured and/or specified requirements taken together would act as a safe-guard against low results in UCTL tests.

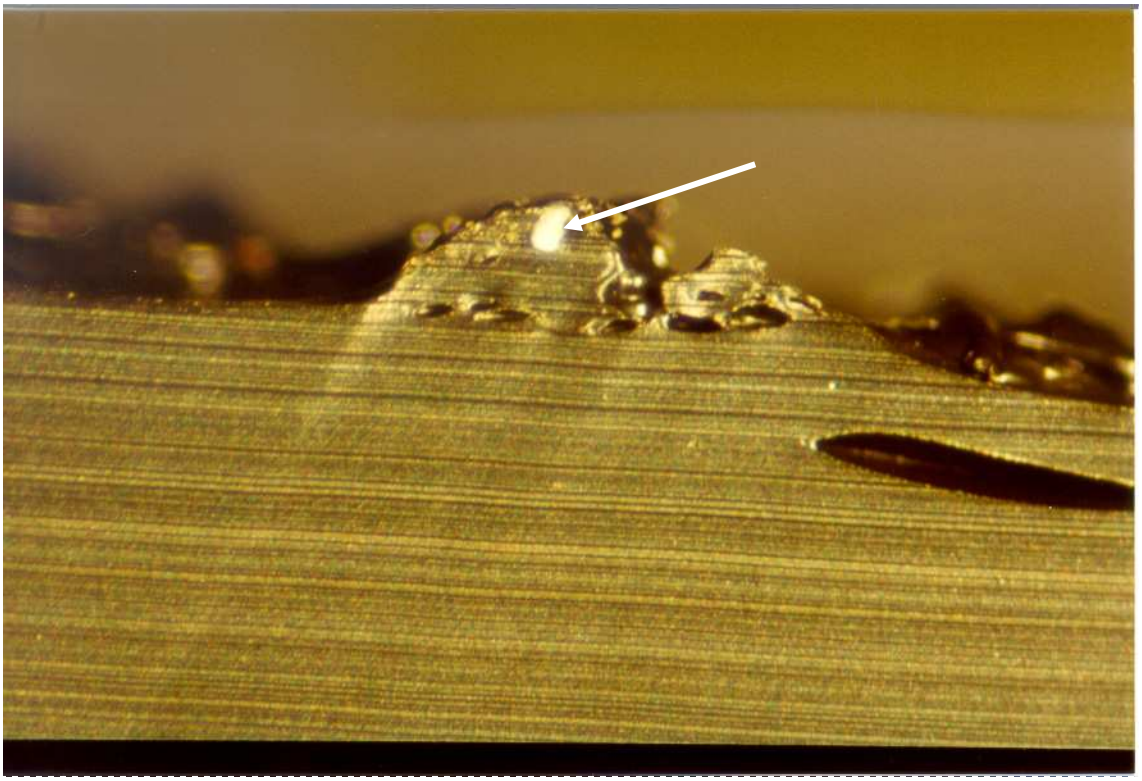

Figure 1. Although containing different resins for core and texture (note unblended resin in texture), relatively less blemished C2 (cross section 40X mag) did not stress crack in >700 hours of UCTL testing.

The results demonstrate that good base resin may be "ruined" by bad texturing. Furthermore they point to a correlation between easily measured and/or specified physical performance features, and times-to-failure in more difficult, time consuming, and costly UCTL stress crack testing.

IMPLICATIONS FOR SPECIFICATIONS

Good specification of textured geomembranes should address the potential for surface roughening to promote failure in UCTL stress crack testing, and thus to promote earlier failure

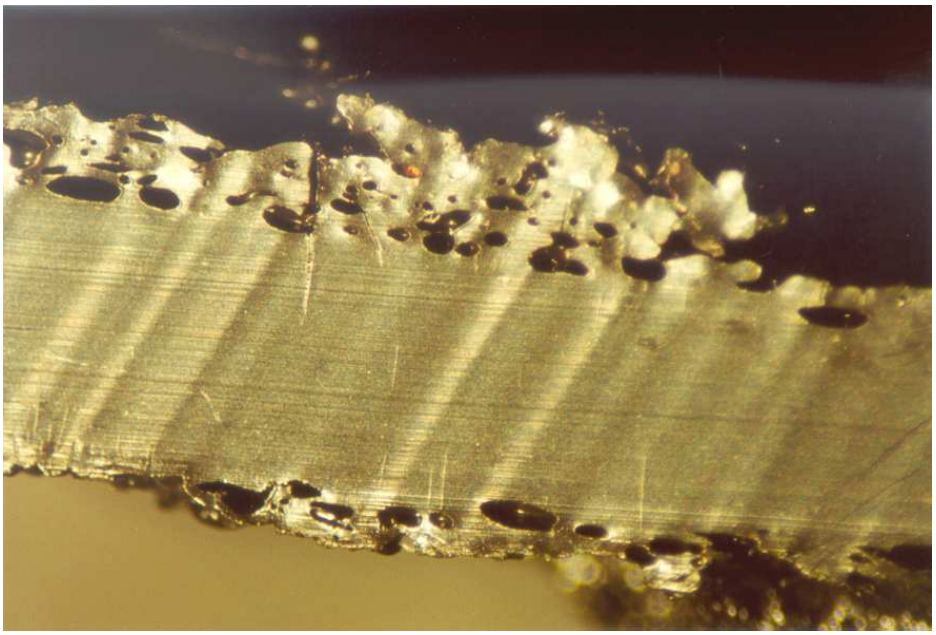

Figure 2. Numerous stress cracks initiating through surface resin containing particulates and unblended resin, in highly textured surface of sample C3 (cross section 25X mag). Stamped plaque gave NCTL result >1000 hours which by itself would have made this textured sheet acceptable while failing in UCTL.

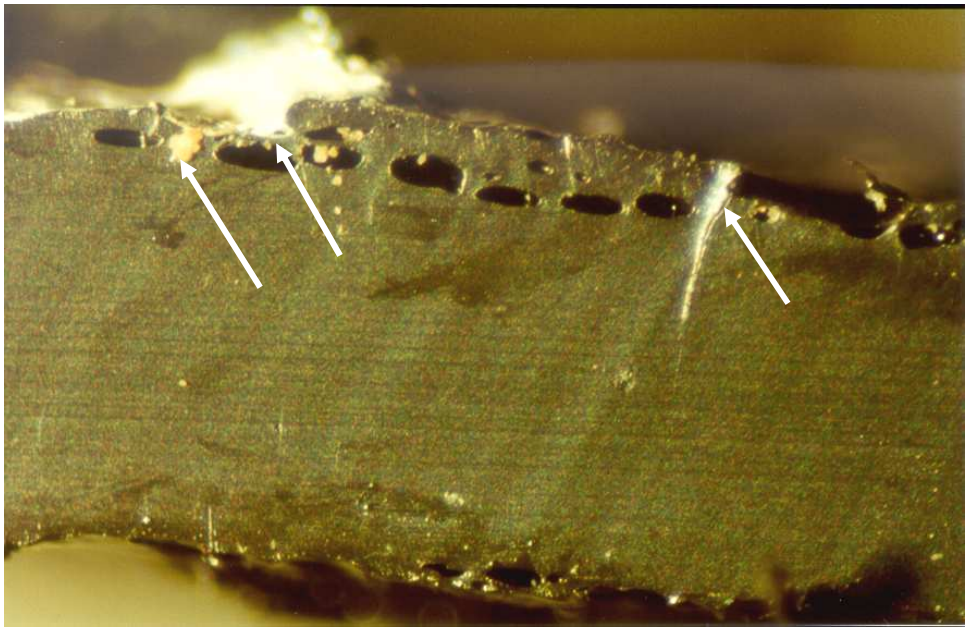

Figure 3. Stress crack failure in UCTL testing caused by different material in textured surface of sample C4 (cross section 40X mag).

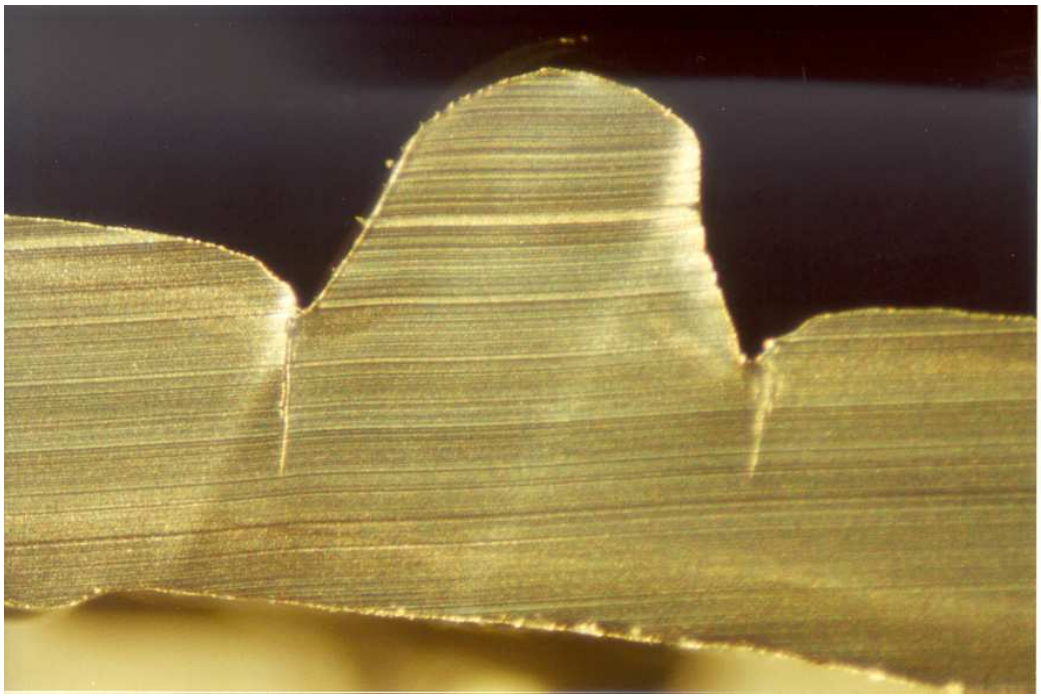

Figure 4. Sharp edge of a very large texture asperity is location of these stress cracks in Sample A3 (cross section 30X mag).

in application. The data presented here confirm earlier published work noting that good base resin selection can be thwarted by surface blemishing. Specifiers should address this concern when specifying textured sheet, not simply depend on NCTL testing for base resin quality.

The importance of these considerations for specifications is clarified by the recent demonstration that stresses are not entirely relieved in wrinkles trapped beneath landfills. Soong and Koerner (1998) studied the behavior of waves buried in landfills and report that wave distortion under loads produce stresses not entirely overcome by stress relaxation, with residual tensile stress varying from 1% to 22% of yield at 10,000 hours under load. Koerner et al (1998) exhumed HDPE geomembrane after eight years of landfill liner service and found waves remaining trapped in place with reduced stress crack resistance in the “waved” versus non-waved geomembrane samples. Stresses remain in buried geomembranes. Therefore it is important for those geomembranes to resist stress cracking to their achievable and best ability.