May 30, 2013

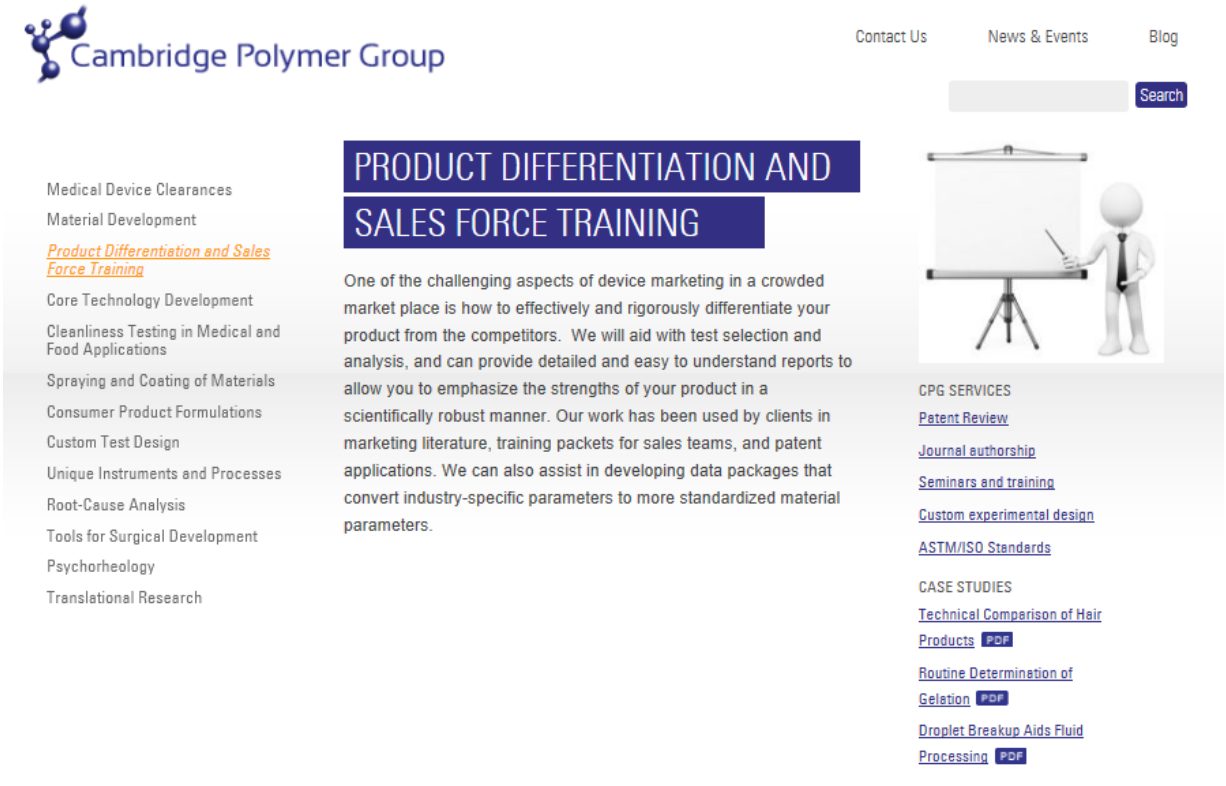
Cambridge Polymer Group

How Crack Resistant is My Polyethylene?

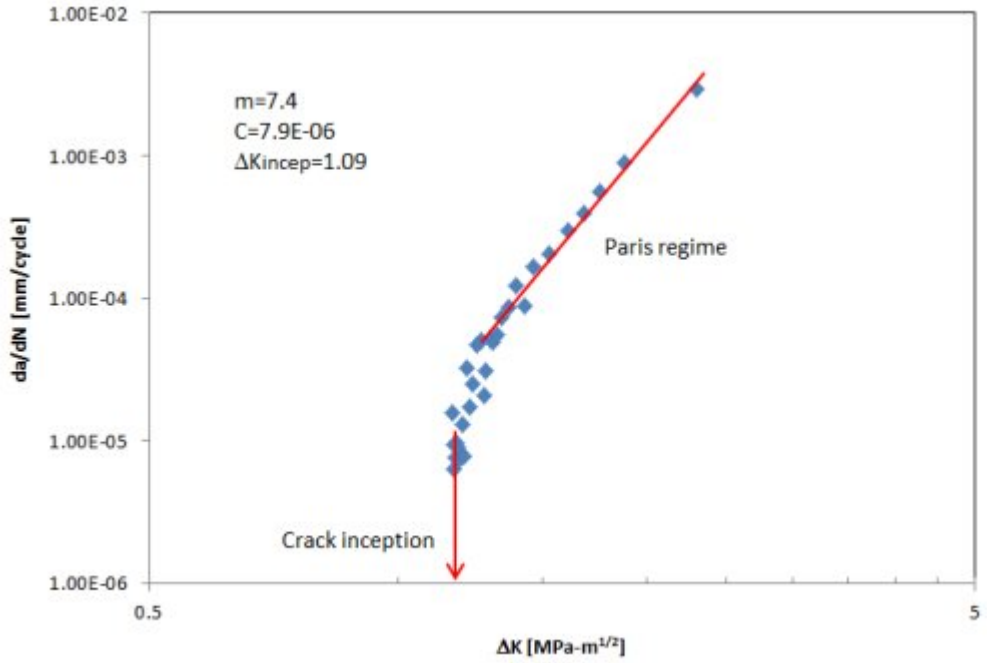
This newsletter summarizes testing techniques, materials, and new announcements from Cambridge Polymer Group.

Cambridge Polymer Group has a new look

As you may have noticed from our header, we have changed our logo after 15 years. This change comes with a new web site, which we just rolled out this month. Each page contains relevant application notes, case studies, and presentations. Let us know what you think!



Fatigue Crack Propagation



Fatigue crack propagation (FCP) analysis is a method to monitor the resistance of a material to crack inception and propagation under cyclical loading. ASTM E647 describes the methodology for measuring crack propagation in materials. An example of the typical data obtained in FCP analysis is shown above for GUR 1020 UHMWPE subjected to ionizing radiation measured at Cambridge Polymer Group. There are two principle regimes in a crack propagation plot: (1) crack inception, where the minimum load range required to start a crack to grow is determined; (2) Paris regime, where steady crack growth occurs. The x-axis shows ΔK, which is derived from linear elastic mechanics and is dependent on the cyclical load range (P_{max}-P_{min}) and the crack length (a). The expression for ΔK will depend on the shape of the test specimen, which is often a compact tensile geometry. The y-axis shows the crack growth as a function of number of fatigue cycles. The main reportable items for FCP analysis are the ΔK_{incep}, or the load conditions for crack growth to reach 1e-6 mm/cycle, and the slope and intercept of the curve in the Paris regime (m and C, respectively). With highly crosslinked UHMWPE, the ΔK_{incep} tends to decrease, and the material sometimes shows a higher sensitivity to ΔK in the Paris regime.

Download the FCP application note

What Happened at ASTM?

The spring meeting of ASTM took place in Indianapolis, IN from May 21-23rd. Cambridge Polymer Group researchers participated in standards development and discussion. New standards for UHMWPE were discussed, along with on-going development of medical device cleanliness standards and bone cement standards. Contact CPG for more details, or link to our blog below which outlines more of the ASTM discussions.

More details

Cambridge Polymer Group, Inc. is an ISO 9001:2008 certified contract research laboratory specializing in polymeric materials. We provide routine analytical testing on materials, custom test design, failure analysis, consultation, instrumentation, custom polymer and hydrogel formulation, and out-sourced research.

Cambridge Polymer Group
56 Roland Street, **Suite 310**
Boston, MA 02129
617.629.4400 (office)
617.629.9100 (fax)
info@campoly.com
www.campoly.com