



Cambridge Polymer Group

How Crack Resistant is My Polyethylene?

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

- (1) [Cambridge Polymer Group has a new look](#)
- (2) [Fatigue crack propagation in polyethylene](#)
- (3) [What happened at ASTM?](#)

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!



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 Search

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Material Development

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Core Technology Development

Cleanliness Testing in Medical and Food Applications

Spraying and Coating of Materials

Consumer Product Formulations

Custom Test Design

Unique Instruments and Processes

Root-Cause Analysis

Tools for Surgical Development

Psychorheology

Translational Research

PRODUCT DIFFERENTIATION AND SALES FORCE TRAINING

One of the challenging aspects of device marketing in a crowded market place is how to effectively and rigorously differentiate your product from the competitors. We will aid with test selection and analysis, and can provide detailed and easy to understand reports to allow you to emphasize the strengths of your product in a scientifically robust manner. Our work has been used by clients in marketing literature, training packets for sales teams, and patent applications. We can also assist in developing data packages that convert industry-specific parameters to more standardized material parameters.



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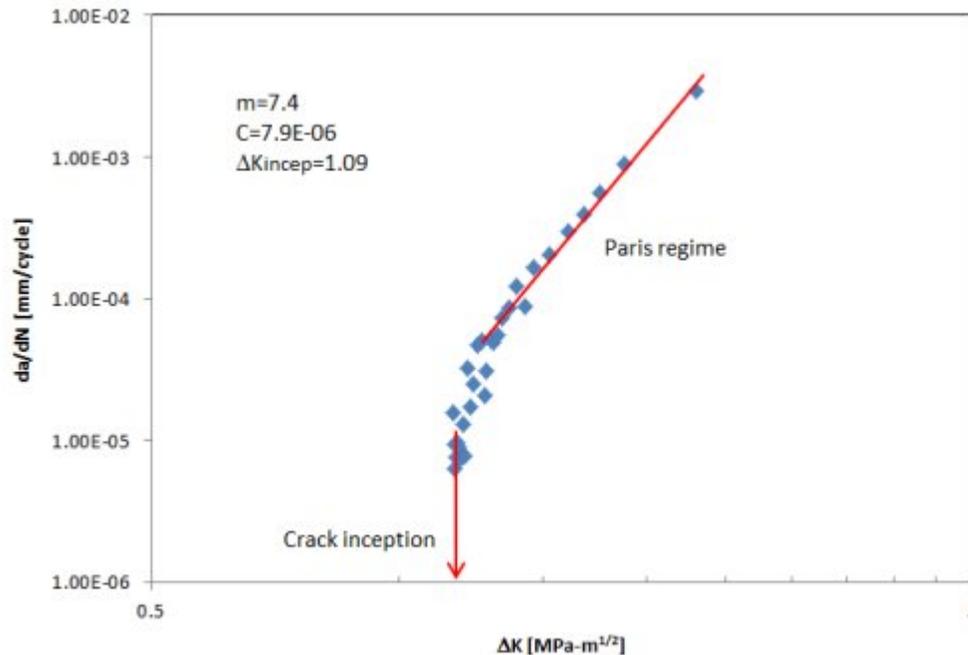
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Fatigue Crack Propagation



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 ($P_{\text{max}}-P_{\text{min}}$) 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 $1\text{e-}6$ 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.

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