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Fast Data Sampling for Monitoring of a Rapidly UV-curing System

M. Nowak (a), T. Chen (b) and A. Franck (a)
(a) TA Instruments, D-63755 Alzenau, Germany
(b) TA Instruments, New Castle, DE 19720, USA

For monitoring rapid processes a fast data acquisition is a necessary but not sufficient prerequisite. The raw data, once acquired, have to be evaluated in order to obtain rheological properties, characterizing the evolution of the process under investigation. Furthermore, an increase of the torque sensor's dynamic range in order to monitor the complete processes is required.
The monitoring rate is on principle determined by the imposed frequency. In general, rheometers generate at best one data point per second and require at least one cycle of acquired data for analysis.
If the process is too fast, half- or quarter-wave analysis can be used to increase the number of data points per time unit. However, this is only a marginal advance, but reduces the accuracy and the torque transducer's dynamic range.
A better approach is to apply an under-sampling algorithm. This procedure uses a FIFO-stack of the most recent raw data for the evaluation of the rheological parameters, which can be invoked independently of the renewal time of the buffer.
By this means, up to 100 transient data points per second can be obtained, continuously following the evolution of even rapid processes. For a maximum significance of the determined data just the time interval between subsequent data points and the ratio of new data to buffer length have to be optimized.
In this presentation we demonstrate the benefit of the under-sampling algorithm for the advanced rheological characterization of a rapidly changing UV-curing adhesive. This system is investigated in oscillatory shear under several different experimental conditions, such as sample geometry, intensity and exposure time of the UV light.