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## On Merging DMA and Microindentation to Determine Local Mechanical Properties of Polymers

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### Abstract

Micro- and nanoindentation and Dynamic Mechanical Analysis (DMA) are different methods to determine mechanical and viscoelastic material properties. The aim of this study was to broaden the capabilities of their utilization by merging these methods. Three standard diamond indenters and a tungsten needle were implemented in a conventional DMA. Four types of standard polymers were investigated. Quasi-static microindentation was performed to determine local material static stiffness, and dynamic microindentation was performed to evaluate local material complex modulus. The results of the quasi-static microindentation showed that different static stiffnesses of the polymers can be distinguished. Even the smallest differences in local mechanical properties due to processing and annealing were distinguished. The complex moduli determined by dynamic microindentation were in good agreement with literature values and three-point bending results. It was shown that a conventional DMA is suitable to determine local and bulk mechanical viscoelastic material properties within one instrument.

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