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Dielectric Spectroscopy Analysis of Aged EVOH films with Application to Deterioration of Food Packaging Materials TIMOTHY HOELLER[1], DQR Testing Services — Samples of EVOH films from compositions of 29 - 44 mol% ethylene content were exposed to thermal aging with and without light exposure. The results of Dielectric Spectroscopy on select samples showed Cole-Cole plots of skewed dielectric constant indicating multiple distributions of dipole relaxation times. The onset for decreases in dielectric response occurs earlier in samples exposed to elevated temperature under light exposure. Lower permittivity is exhibited in samples of higher ethylene content. Results from heat exposed samples are presented. Colorimetric analysis indicates only a slight film yellowing in one case. Raman spectroscopy on untreated films discerns changes in the C-C-O stretch associated with the alcohol. The effects of aging on microstructure may cause hindrance of molecular motion from moisture desorption. Slight material degradation occurs from film hardening presumably due to crosslinking. An electrical circuit model of the conduction processes associated with the EVOH films is presented. Dielectric analysis shows promise for monitoring material changes related to deterioration. We are also using these methods to understand Fluorescence Imaging which has been recently released for paper and plastic materials analysis. Future work may include refinement of these techniques for identification of changes in material properties correlated to packaging material barrier resistance.

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