
**Tire Aging Studies Using Modulus Mapping and Diffusion Limited Oxidation Model**

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*Abstract*

The extent and location of aging in a light tire was studied. Some tire components experienced modulus change during aging as much as 100% change. In general, tire aging may include one or more of the following mechanisms - thermal reversion, oxidation, and mechanical softening. The details of aging at a fine resolution can be captured with modulus profiling. The effect of oxidation was compared to model predictions from the Difthsion Limited Oxidation Model DLO. Several examples of light tire aging in various tire locations were studied. The modulus profiler technique was pioneered by Gillen and has resolution of about 0.1 mm. The location and extent of aging was measured by modulus change from innerliner to tread. In some location mechanical softening modulus decrease dominated and oxidation modulus increase in other tire components. Aging was studied this way in various service conditions. Tire samples were oven aged and compared to a worn tire after normal service. The results of oxidation were compared to predicted results by the DLO model. In general, the results were found to be in agreement with predictions from the DLO model. In summary, this study applied modulus mapping and DLO model to tire aging - light tire shoulder region, lab aged tires, and lab aged test specimens. Future work to understand tire aging is important for tire durability development.

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