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## **Degradation Model Using the Arrhenius Life-Stress Relationship Applied to Smoke Sensor Detectors**

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**Abstract:** The accelerated degradation is related to models and data analysis to measure product performance. Degradation is induced over time with overwork of the product. Accelerated degradation tests have some advantages over accelerated life tests. The degradation of the performance data can be analyzed, for example, before the product presents a failure. That is, the extrapolation of the performance degradation to estimate the time when it reaches the level of failure. These extrapolations allow us to examine the effect of life on the various design choices or make inferences about the level of performance resulting in failure. In this paper, a degradation analysis for Arrhenius model is investigated using a Log-Normal life-stress relationship on the study of Accelerated Degradation Testing (ALT) of smoke detector sensors. The investigation consists of doing statistical inference using Bayesian methods and Markov chain Monte Carlo (MCMC) techniques to estimate the parameters involved in the model and predict reliability using degradation of the sensor. Data will be collected from the ADT using a single step stress and its analysis will provide the posterior estimation of parameters and prediction of reliability. Finally, estimation of reliability is presented using the estimated degradation pattern.

*Keywords:* Accelerated Degradation Testing, Bayesian Analysis, Markov chain Monte Carlo Methods, Arrhenius life-stress relationship.