Poster Abstract 11

# Verification of Packaging Seal Life Predictions Using Thermoanalytical Techniques

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Thermogravimetric analysis (TGA) provides a promising means of quickly and economically estimating service lives of elastomeric seals typically used in radioactive material (RAM) packages. In a study at Sandia National Laboratories, samples of three common elastomer materials--fluorocarbon, silicone and etheleyne propylene (EPDM) rubber--were tested using this technique. Results from these tests provided a means of calculating the kinetic activation energies for these materials, which in turn were used to calculate estimates for the maximum seal service lives of the materials at various operating temperatures. To demonstrate that these material property predictions do indeed translate into leak tightness and a reliability requirement defined for seals used in RAM packaging, a follow-up study was conducted. Actual seals made from the three elastomer materials were subjected to time-temperature conditions derived from the TGA study. Nine sample seals of each material were heated for one, ten, one hundred, and one thousand hours at the temperatures previously predicted for reliable seal life. The seals were then leak-tested in specially designed, stainless steel flange fixtures using the helium mass spectrometer leak detector and associated data acquisition equipment previously used in low and high temperature seal performance studies. Data from this follow-up study will be presented, with the results verifying the seal life predictions derived from TGA measurements.

*Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the U.S. Department of Energy under Contract DE-AC04-94DP85000.*