

VOLATILE OUTGASSING INVESTIGATIONS OF EVA BASED MATERIALS IN SUPPORT OF SYSTEM LEVEL AGEING MODEL DEVELOPMENT

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There are many proven methods for predicting ageing trends in individual polymeric materials and components from data generated in thermally accelerated ageing experiments. Once materials are placed into systems in combination with others, however, a number of factors make the prediction of trends far more complicated. There may be important interaction between materials, which age at different rates and failure may result from degradation processes that are influenced by complicated diffusion pathways. A strategy of building up experimental complexity to interrogate, understand and de-convolute these factors has been pursued. The paper will briefly discuss the associated system model and detail the accelerated ageing experiments carried out on EVA based materials to populate the model currently being developed at AWE.

Our initial focus has been gas phase Infra-red (IR) spectroscopy for speciation and quantification of outgassing rates of key species. The release of inventory material dominates the early outgassing properties of the EVA materials. The species evolved are typically acetic acid, carbon dioxide and water, with acetic acid dominating the gas phase composition. For comparison purposes, we have also carried out studies on VCE binder material and the results of these initial trials will also be detailed in this presentation.

In each case, our studies show that inventory material (i.e species within the network produced from earlier degradation such as during processing or picked up during storage) dominates the outgassing and headspace composition. Under the conditions of interest, the production of species during the experiments (real-time) through chemical reactions appears to be negligible.

These activities are aimed at developing a robust ageing model that supports a larger system level ageing model. The development strategy including the key parameters of interest (such as quantification of inventory levels) will be detailed in this presentation.