Improved energy efficiency and durability are demanded for sealing components in multiple industries. Flat elastomer plates were coated with a polymeric film (SiOxCyHz) in a plasma-enhanced chemical vapour deposition process. The film thickness was varied from approximately 0.7 µm to 4.0 µm. Tribological lifetime tests were performed as a function of the applied film thickness. The investigated elastomeric substrate materials were acrylic rubber, fluororubber and nitrile butadiene rubber. Oscillating ball-on-plate contact was chosen to induce rapid wear. Significant wear protection was found to depend on applied load and elastomer type. Film thicknesses in the range of 1 µm to 2.5 µm were recommended.

The following article discusses the use of novel compounds of the Tegosil series, which are intended to significantly increase the thermal conductivity of HCR and even LSR based silicone elastomers or – by adding such compounds – improve the flame retardant properties in an easy way. Heat transfer characteristics from hot disk testing are presented and the reduced burning time in the UL 94 evaluation illustrates the improved flame resistance of the resulting elastomer formulations.

Elastomers are often degraded when exposed to air or high humidity for extended time periods (years to decades). Lifetime estimates normally involve extrapolating accelerated aging results made at higher than ambient environments. Several potential problems associated with such studies are reviewed and experimental/theoretical methods to address them are provided. The importance of verifying time-temperature superposition of degradation data is emphasized as evidence that the overall nature of the degradation process remains unchanged versus acceleration temperature. The confounding effects that occur when diffusion-limited oxidation (DLO) contributes under accelerated conditions are described and it is shown that the DLO magnitude can be modeled by measurements or estimates of oxygen permeability coefficients (P_Ox) and oxygen consumption rates (f). P_Ox and f measurements can be influenced by DLO and it is demonstrated how confident values can be derived. Additionally, several experimental profiling techniques that screen for DLO effects are discussed. Values of f taken from high temperature to temperatures approaching ambient can be used to more confidently extrapolate accelerated aging results for air-aged materials and many studies now show that Arrhenius extrapolations bend to lower activation energies as aging temperatures are lowered. Best approaches for accelerated aging extrapolations of humidity-exposed materials are also offered. Part 1 (RFP 1|2017) has covered the time-temperature superposition approach (chapter 2) and diffusion-limited oxidation (DLO) complications (chapter 3). Part 2 discusses O2 consumption measurements to model DLO and test extrapolations (chapter 4) and predicting lifetimes for humidity sensitive elastomers (chapter 5).
P. MUTYALA

Comparison of blends of devulcanized tire rubber and EPDM with polypropylene

Safe disposal and reuse of waste tires has been and continues to be a significant environmental challenge. Statistics show that the number of waste tires is increasing at a very rapid rate. The Rubber Manufacturers Association (RMA) estimates that about 250 million scrap tires were generated in the USA in 2013 [1]. Scrap tire generation rate has steadily increased along with population in the USA. Since rubber materials do not decompose easily (due to their crosslinked structure and presence of stabilizers), piling up of waste tires is a significant environmental problem. On the other hand, the next biggest scrap rubber produced in the world would be EPDM waste mainly from the booming automotive industry. A novel extrusion reclamation method has been developed that can produce a reclaimed rubber (referred to as devulcanized rubber (DR) from here on) of very high quality [2, 3, 4]. In addition, this method has been proven to be economically viable in contrast to several other reclamation methods and works on various kinds of rubbers. To explore the commercial applications of these devulcanized rubbers, their performance in blends with polypropylene (PP) have been studied, which has been summarized in this paper.

R. PAZUR, T. KENNEDY

The effect of plasticizer extraction by jet fuel on a nitrile hose compound

Seven ester plasticizers were evaluated in a reference NBR rubber fuel hose compound with respect to extractability resistance to jet fuel. Plasticizers differed primarily in chemical structure (polarity) and molecular weight (monomeric versus polymeric). Plasticizer addition lead to lower viscosity, maximum torque, modulus, tensile strength and enhanced low temperature properties. Exposure to jet fuel caused plasticizer extraction resulting in compound softening due to absorption of the aromatic components in the fuel. The glass transition temperature shifted towards lower temperatures. Extraction resistance is enhanced by optimizing polymer-plasticizer compatibility and by using a higher molecular weight plasticizer. The use of the polymeric plasticizer A-8600 lowers the loss of other fugitive plasticizers indicating the presence of specific plasticizer-plasticizer interactions. Of the monomeric and polymeric plasticizers, Triocyl Trimellitate (TOTM) and A-8600 respectively, display the best combination of plasticizing ability and extraction resistance.

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