

Characterization of the degradation of elastomeric gasket by accelerated ageing

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Pressurized Metered Dose Inhalers (PMDIs) are required to keep the propellant and the active substances within the chamber and the canister. The long-term durability of PMDIs heavily depends on the functionality of the gaskets. Both chemical and mechanical degradations of the sealing material are of a great concern to the durability of inhalers and the stability of the overall performance. Our work focuses on the investigation of the mechanism inducing the premature ageing of elastomeric gasket found in PMDIs.

Attenuated Total Reflection Fourier-Transformed Infrared (ATR-FTIR) spectroscopy, contact angle as well as X-ray Photoelectron Spectroscopy (XPS) are employed to characterize the surface chemistry of the elastomer, before and after ageing. Dynamic Mechanical Analysis (DMA) and tensile tests are performed to assess the changes in mechanical properties during the ageing process. Optical microscopy and Scanning Electron Microscopy (SEM) are also employed to determine any physical changes. Swelling tests are conducted to study the evolution of the cross-linking density and the critical mass over time.

The study of the mechanical, chemical and physical behavior of elastomeric materials will allow a better understanding of the overall ageing phenomenon. As a result, the improvement of used materials composition or the development of new products for PDIMs would respond to the clients/market needs as well as the new REACH regulation.

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