

Thermo-Oxidative Degradation of Asphalt Modified with High Density Polyethylene and Engine Oil

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Abstract : Paved roads are designed for 10-15 years of life. However, many asphalted roads suffer degradation before reaching their lifetime due to aging caused by load conditions and climatic factors. Oxidation is the main asphalt aging mechanism, which leads to a reduced bond between aggregate particles, increasing the potential for stripping and moisture damage, decreasing fatigue lifetime and reducing resistance to thermal cracking. To improve the performance of asphalt and mitigate these problems, modifiers such as polymers, oils and certain residues have been used. This work aims to study the influence of the addition of high-density polyethylene (HDPE) and engine oil on the thermal stability of asphalt in an oxidizing atmosphere. For the study, compositions containing asphalt, motor oil and HDPE were prepared, varying the concentration of the motor oil by 2.5%, 5%, 7.5% and 10% and keeping the HDPE concentration fixed at 5%. The results show that the pure asphalt sample is degraded in a single step that starts at approximately 311 °C; All samples of modified asphalt except the one that contains 5% of motor oil have three degradation steps that start below the starting temperature of degradation of pure asphalt (about 250-300 °C); The temperature of onset of degradation of the modified asphalt is shown to decrease as the concentration of the motor oil increases, suggesting a slight loss of thermal stability of the asphalt as the quantity of the motor oil increases.

Keywords : Asphalt, DTG, engine oil, HDPE, TGA

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