

The Effect of Linear Low-Density Polyethylene Cross-Contamination by Other Plastic Types on Bitumen Modification

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Abstract : Currently, the recycling of plastic wastes has been the subject of much research attention, especially in pavement constructions, where virgin polymers can be replaced by recycled plastics for asphalt binder modification. Among the plastic types, recycled linear low-density polyethylene (LLDPE) has been one of the common and largely available plastics for bitumen modification. However, it is important to note that during the recycling process, LLDPE can easily be contaminated with other plastic types, especially with low-density polyethylene (LDPE), high-density polyethylene (HDPE), and polypropylene (PP). The cross-contamination of LLDPE with other plastics lowers its quality and, consequently, can affect the asphalt modification process. This study aims to assess the effect of LLDPE cross-contamination on bitumen modification. To do so, samples of bitumen modified with LLDPE and blends of LLDPE with LDPE, HDPE, and PP were prepared and compared through physical and rheological evaluations. The experimental tests, including softening point, penetration, viscosity at 135 °C, and dynamic shear rheometer, were conducted. The results indicated that the effect of cross-contamination on softening point and rutting resistance was negligible. On the other side, penetration and viscosity were highly impacted. The results also showed that among contamination of LLDPE with the other plastic types, PP had the highest influence in comparison with HDPE and LDPE on changing the properties of the LLDPE- modified bitumen.

Keywords : recycled polyethylene, polymer cross-contamination, waste plastic, bitumen, rutting resistance

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