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New study on improved performance of paving asphalt by crumb rubber and polyethylene modification

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It is thought that the application of recycled solid industrial wastes (SIW) such as automobile tires and plastics will not only solve the global environmental problem of these SIWs problem but also act as very promising modifiers for the improvement of engineering characteristics of the asphalt pavement material. The rheological study of polymer and rubber modified asphalt are usually made through penetration point, softening points and viscosity test. In this present study, an attempt has been made to use crumb rubber tires (CRT) and low density polyethylene (LDPE) is added to modify the physical characteristics of asphalt. The reclaimed rubber in the form of powder having a particle size range of 0.0 - 0.8 mm was used as an additive to liquid asphalt using the hot mix asphalt process (HMA). For a consistent mix, the blending operations were performed with different CRT and LDPE contents; 3%, 5%, 7%, 10% and 15% by weight. The same ratio of polymer-rubber composite was also added to the base asphalt. The results of this work has indicated that these modified asphalt patterns are characterized by having softening point and penetration points leading to a suitable penetration index (PI) in comparison with base asphalt binder. The viscosity of base asphalt was also enhanced with the addition of additives. Best results were obtained when polymer, rubber and polymer-rubber composite concentrations were kept below 5%, 15% and 10% respectively. As well as the dynamic mechanical analysis (DMA), phase distributions of micrographs from scanning electron microscopy (SEM) and spectral analysis from Fourier transform infrared spectroscopy (FT-IR) were studied.

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