

Rheological investigation of the influence of acrylate polymers on the modification of asphalt

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Abstract: The effect of ethylene, ethylene acrylate and glycidyl methacrylate (EA) terpolymer, and ethylene butyl acrylate (EBA) copolymer on asphalt modification was investigated at 4, 6 and 8% polymer concentrations. Both melt state rheology and asphalt concrete mix (ACM) were investigated. In the melt state analysis, dynamic shear rheology, storage stability, artificial ageing, and performance grading (PG) were studied. The PG grading of polymer modified asphalt (PMA) is correlated to the elastic properties of the polymers. Both resins improved the rheological properties, reduced the temperature susceptibility, showed better storage stability, and increase the upper grading (performance) temperature of the base asphalt. The two polymers showed similar ageing characteristics with little influence on flow activation energy. In asphalt concrete mix analysis, Marshall stability, stripping (durability), resilient modulus, and permanent deformation tests were performed. Polymer-modified asphalt concrete mix (PMACM) has increased percent retained stability and the resilient modulus when compared with ACM. The elastic modulus of PMA and the resilient modulus of their ACM followed the same trend. Weak influence on water sensitivity was observed, but excellent rutting resistance was obtained for PMACM over ACM. EA (much cheaper than EBA) produced satisfactory properties of PMA and superior ACM properties when blended with the high asphaltenes Arabian asphalt. © 2006 Wiley Periodicals, Inc.