

Evaluation of elevated temperature properties of asphalt cement modified with aluminum oxide and calcium carbonate nanoparticles

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Abstract. Higher temperature properties of the asphalt cement have been characterized before and after modification using dynamic shear rheometer (DSR) and viscosity testing. In this study, calcium carbonate nanoparticles (CaCO_3) and aluminum oxide nanoparticles (Al_2O_3) have been added to the base asphalt cement with concentrations of 3, 5 and 7%.wt by the weight of the asphalt cement. The increase of CaCO_3 and Al_2O_3 content has significant effect on the properties of asphalt cement. The viscosity of the modified asphalt cement increased up to 90 and 108% respectively compared to the base asphalt cement. In addition, the results showed that both modifiers have great storage stability and compatibility at elevated temperature. The evaluation of the rheological properties of asphalt cements revealed that the stiffness of the modified samples improved with additional increase of the modifier concentration of up to 5%, which indicates better resistance to rutting parameter. The enhancement was up to 388.89% for Al_2O_3 and 74.07% for CaCO_3 . As a result, the usage of CaCO_3 and Al_2O_3 nanoparticles can be considered as appropriate alternative materials to modify asphalt cement.