

**INVESTIGATION ON THE PHYSICAL AND RHEOLOGICAL
PROPERTIES OF ACRYLATE-STYRENE-ACRYLONITRILE
POLYMER AND NANO ALUMINUM OXIDE MODIFIED
ASPHALT BINDERS NANO ALUMINUM OXIDE MODIFIED
ASPHALT BINDERS**

Shaban Ismael Albrka Ali

PhD student, Sustainable Urban Transport Research Centre (SUTRA),
Universiti Kebangsaan Malaysia UKM, Malaysia.

Amiruddin Ismail

Professor, Head of Sustainable Urban Transport Research Centre (SUTRA),
Universiti Kebangsaan Malaysia UKM, Malaysia

Nur Izz Md. Yusoff

PhD, Sustainable Urban Transport Research Centre (SUTRA), Universiti
Kebangsaan Malaysia UKM, Malaysia

ABSTRACT

This study investigates the physical and rheological properties of asphalt binder modified by acrylate-styrene-acrylonitrile (ASA) polymer and nano aluminum oxide (AL_2O_3). The tests implemented in the study were conventional tests, rotational viscosity, X-ray diffraction (XRD) and dynamic shear rheometer (DSR). The obtained results of conventional tests showed that the addition of both modifiers up to 5% increased the hardness of asphalt and reduced their temperature susceptibility. XRD results outcome approved new structural phases formed by using ASA polymer meanwhile structural of base binder had not changed by adding nano AL_2O_3 . The rheological property of modified binders enhanced at low temperatures and high temperatures, as the results of DSR test showed that the complex modulus and fail temperature were improved whereas the phase angle decreased slightly. Adding a different concentration of ASA and AL_2O_3 to base binder had significant effects of high temperatures rutting resistant and improved low temperature fatigue. Obviously the influence of nano AL_2O_3 on base asphalt binder was greater than modification of ASA polymer. *KEYWORDS*: modified asphalt binder, ASA polymer, nano AL_2O_3 , Physical and rheological properties and DSR.