

ABSTRACT

Long-term performance of asphalt pavement is a major challenge and ultimate goal of highway Engineering agencies. The use of polymer in asphalt mixture as a modifier started in the 80s of the last century and has been tested in a number of countries around the World. In this research, Tire Rubber as one type of polymers is used to investigate the potential prospects to enhance bitumen physical and asphalt mixture properties. The purpose of this study is to evaluate the effect of using various crumb tire rubber percentages as polymer additives to bitumen and hot mix asphalt concrete at Khartoum State. It was investigated that the influence of rubber-modified binder obtained by various mixing time, mixing temperature and rubber content on the bitumen and mixtures performance tests. 60/70 asphalt grade was used in unmodified mix and modified binders used in Asphalt Rubber Hot Mix (ARHM) were prepared by mixing the rubber in 15, 20 and 25% (by the weight of bitumen content) at temperatures 160,165°C and 2, 4 hour of mixing time for 15 and 25% asphalt rubber respectively, 20% was blend at 160°C for 3 hour simulated to 15, 25% morphology test under Leitz Dialux 2D microscope results. Physical properties were evaluated in terms of penetration, softening point, specific gravity, ductility, flash and fire point tests. Marshall Mix design was used to evaluate the mixtures properties. 60 samples were prepared to evaluate the effect of Crumb Tire Rubber Modified Bitumen for Hot Mix Asphalt Concrete. The results indicated that crumb rubber modifier provides better engineering properties in terms of penetration, softening point, specific gravity flash and fire point tests except ductility test attributed to some fabric content in tire, and indicated that crumb rubber modifier slightly decrease the stability and density, increase the flow, and slightly increase the air voids and the voids of mineral aggregate. The study recommended that farther studies should be conducted in mixing time and temperatures, bitumen physical properties in terms of viscosity and loss on heating and recommended that use Tire-derived pyrolytic oil to enhance the asphalt rubber ductility and recommended that conducted field test on rubberized constructed section such as Coca-Cola industry district constructed section at Khartoum State