



Influence of Natural Zeolite and Paraffin Wax on Adhesion Strength Between Bitumen and Aggregate

Muhammad Tausif ^{a*}, Syed Bilal Ahmed Zaidi ^b, Naveed Ahmad ^c,
Muhammad Sohail Jameel ^a

^a MSc, Department of Civil Engineering, University of Engineering and Technology Taxila, Pakistan.

^b Assistant Prof. Department of Civil Engineering, University of Engineering and Technology Taxila, Pakistan.

^c Associate Prof. Department of Civil Engineering, University of Engineering and Technology Taxila, Pakistan.

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Abstract

Asphalt mixture that is used for the construction of flexible pavements is mainly composed of two constituents i.e. bitumen and aggregate. Sturdy adhesion among bitumen and aggregate is the sign of durability of asphalt pavements. Adhesion is considered as one of the most important factors for sustainable asphalt pavement. This is the motive why its miles utmost important to deeply understand the phenomenon of adhesion considering the effect of alternate in temperature, moisture conditions. In this study softer binder 80/100 was selected that has less adhesion compared to hard pen grades. Limestone aggregates which is commonly used for the construction of asphalt pavements has also been selected. Two types of modifiers (Zeolite and Paraffin Wax) were selected because of the extensive use in asphalt foaming and the polymer modified asphalt mixtures as temperature reducing agent. To investigate the strength of adhesive bond, Bitumen Bond Strength (BBS) was performed at different temperatures, in dry, and wet conditions. To quantify the effect of modifiers on penetration grade and softening point conventional testing is performed. For performance grading, the PG test was performed using Dynamic Shear Rheometer. The comparisons were developed among pull of tensile strength at dry and after 72hrs water conditioning while preserving the temperature at 25°C. To check the effect of temperature BBS is performed at 15 °C. The results illustrate that 2% zeolite shows best results in terms of adhesion and performance grade while Paraffin wax has less adhesion and poor performance grade.

Keywords: Bitumen; Aggregates; Adhesion; Pen Grade; Softening Point; BBS; DSR; Performance Grade.

1. Introduction

Most of the pavement are constructed in the world are asphalt pavements. During the life period, these pavements must bear climate impact in terms of moisture, temperature and loads. The major reason for pavements deformation is moisture damage [1]. Introduction of moisture into asphalt pavements leads to adhesion loss between the binder and aggregates. The deformation of asphalt pavements mainly is due to adhesion loss [2]. Diffusion of water into pavement layers weakens the adhesive bond between aggregate and bitumen. The occurrence of stripping is due to debonding, which is caused by water ingress. Studies have done on properties of asphalt pavements shows that the mechanical properties of flexible pavement depend on the bond between the binder and aggregate. The strength of the interface bond between binder and aggregate defines the life of pavement and its potential to withstand against heavy loading and climate condition.

* Corresponding author: tausif.sindhu@yahoo.com

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