

Studying the technical effect of carbon nanotube on asphalt mixture with solid granulation

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Abstract: Asphalt, this wonderful mixture that all of us deal with it every day. Perhaps the engineers in this domain as one of the solution have placed the modification of technical properties of asphalt on top of their activities for improvement of the features of this wonderful mixture. Modifying the technical properties of bitumen and asphalt has created many study opportunities all around the world. Along with it and in this article at first, with adding carbon nanotube with the amounts of 0.25, 0.50, 1 and 1.5 weight percent of base bitumen, the effect of this additive on mechanical properties of asphalt mixture was studied. In the continuation, the asphalt samples amplified with carbon nanotube for doing the Marshall Test were evaluated and tested. The results indicated that this additive causes to change in the Marshall test parameters such as increase of strength and reduction of flow. On the other hand, the special weight of asphalt mixture has faced with increase and the void space percent of aggregates faced with relative reduction. Also the void space percent of asphalt mixture and the percent of void space filled with bitumen were increased relatively. In the economic study of the effect of carbon nanotube on mixture, it was concluded that with gradual increase of carbon nanotube, the economical advantage of the project is reduced. Finally, with regard to the obtained results and analysis of the effect of this material on the bitumen and asphalt properties, it was concluded that this additive can be used in the regions with warm climate with heavy traffic and in the limited regions.

Keywords: Carbon nanotube; Bitumen; Asphalt; Marshall.

1. Introduction

Nano materials have been defined as the materials that at least one of their dimensions (length, width, thickness) is below the nanometer. Nano materials of structural elements and constituent components of bitumen and asphalt are in the micro form in Nano scale. Using of nanotechnology can cause to improve the properties of these materials; the resistance of asphalt against the losses arising from humidity, strength and life span, saving in the cost for maintenance of asphalt or the key properties like pressure strength, tensile strength and durability in enduring the load in high temperature degree can be mentioned as some of these properties (Amiri, 2011). In the study of the effect of nanoscale and fiber materials on asphalt, Zarei et al, Zahedi and Zarei and others have been mentioned [1], [2], [3], [4], [5],[6], [7] and [8].