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Research

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# Functional Properties Analysis of SMA Asphalt Mixtures Containing Rubber Powder and rPET

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## ABSTRACT

SMA asphalt mixtures are one of the asphalt mixtures known so far. In these mixtures, the load transfer and degradation process takes place through the direct contact of stone on stone. In these mixtures, like other asphalt mixtures, various additives are used with the aim of improving the performance characteristics. Common additives in these mixtures include anti-stripping additives, polymers, nanomaterials, etc. On the other hand, during the past years, new technology in the production of additives has been developed. In this technology, with the chemical combination of two additives, a new substance is produced, which is referred to as a double additive and has the characteristics of both the main substances. In this research, this issue has been investigated in SMA asphalt mixtures, and the effect of dual additives produced from rubber powder and recycled polyethylene (rPET) has been investigated. The results of this research showed that the use of double additives of this research could meet the performance characteristics of SMA asphalt mixtures better than single additives, and the interaction of the two materials used can compensate for the weaknesses of single additives.

**Keywords:** dual base additive, recycled polyethylene, rubber powder, SMA asphalt mixture.

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## 1. INTRODUCTION

One of the main goals of implementing asphalt procedures on roads is to ensure the performance of these procedures in different load and environmental conditions. Based on this, various types of asphalt surfaces have been developed, among which we can mention hot, semi-hot, SMA, porous, etc., asphalt mixtures. The use of various materials to improve and improve the properties of asphalt mixtures has been the focus of researchers in the field of asphalt pavements for the past years. These materials were either substitutes for stone materials or mixed with bitumen [1]. Considering that the main structure of asphalt pavements includes aggregate and bitumen, any change in these materials or the adhesion and connection system between these materials can change the general characteristics of the

asphalt mixture and affect the useful life of the pavements. [2-3]. Although the research in the field of materials that can be used in the pavement is very wide, in a general classification, it can be stated that: polymers such as SBS, SBR, nanomaterials such as nano clay, isotherm, nano lime, recycled materials such as rubber powder, Recycled poly ethylenes constitute the main bitumen modifying materials [4,5]. On the other hand, recycled materials such as Reclaimed Asphalt Pavement (RAP) and synthetic aggregates such as light polyethylene aggregates as well as slag, constitute the major substitute materials for aggregate modification [6-9]. On the other hand, during the past years, a new range of bitumen additives has been developed in which multiple additives are formed from the combination of two or more additives. In this way, by