Examination on the Rate of Weight Loss of Aggregates in Los Angeles Test in Different media A case study: South side of Daneh Khoshk and Damavand

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Extended Abstract

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Introduction

Aggregates are one of the high demand building materials in construction of structures and their characteristics have important effects on durability and permanence of projects. Abrasion resistance is one of the important features of aggregates that their utilization in concrete and asphalt are affected by texture and lithology of them. As rock consisted of harder minerals have higher abrasion resistance like igneous rocks, due to more siliceous minerals. More varieties in mineralogy compound usually lead to increase in aggregate abrasion. Aggregates that are contained of different minerals usually have less abrasion resistance. Porosity usually decreases the resistance abrasion. In addition to lithological properties, the environment where aggregates are deposited is important in determining resistance-related parameters of aggregates.

Rivers, alluvial fans, and taluses are the main environments where aggregates are deposited. Geological processes, such as weathering and particle movement may cause changes in natural aggregates, hence affecting their abrasion and impact resistance. Rock weathering can results in increasing porosity, producing minerals that are weaker in comparison to their original rock.

In the process of particles transport by stream water, weak parts of aggregates will be omitted. The present study is focused on the relationship between geology medium and the weight loss of aggregate in Los Angeles test.

Methodology

Considering that lithology features in aggregates resistance against abrasion have an important role, in order to examine the effect of various geology environments in abrasion resistance of aggregates, the medium should be chosen having similar lithology. Therefore, the north of Damavand and the south of Daneh Khoshk anticline (north of Dire plain) were firstly chosen by using geology map, satellites images and field study. Damavand zone consists of trachyte and trachy-andesite volcanic rocks. These rocks cover the whole area around the Damavand peak. Also, Daneh Khoshk anticline is covered by thick Asmari formation. The selected environment are in the length of each other. Such that taluses feed alluvial fan and alluvial fans feed rivers. Samples were collected from different area of southern part of anticline. 10 river area, 12 alluvial fan and 6 taluses in the south-west area of Daneh Khoshk anticline (north of Dire plain) were chosen. Los Angeles test has been done according to standard A method ASTM D2216-10, 1990 on samples and the results were analyzed by analogous analyzer.

Results and discussion

Results show that porosity and micro-crack percentage increase, respectively in accumulated aggregate in river, alluvial fans and taluses areas. Also, porosity and micro-crack in various alluvial fans is different and is influenced by the area and length of main channel of alluvial fans' catchment. The porosity decreases by the increase in the length of channel and area of alluvial fans' catchment.

The percentages of aggregate weight loss in talus, alluvial fan and river areas decreases, respectively. Based on the obtained results, the lowest rates of weight loss belong to river environments (23.7 % in Daneh Khoshk and 42% in Damavand) whereas the highest rates of weight loss belong to taluses (49.3% in Daneh Khoshk and 48% in Damavand). The alluvial fans have an average state. Another noticeable point is the high weight loss in Los Angeles test in Damavand aggregate. Due to having harder mineral,

igneous aggregate have more abrasion resistance, but this research illustrates that the weight loss resulting from Los Angeles test in these aggregates is high. This is because of virtues texture that weakness against the impact as well as their high porosity.

Conclusion

The result of this research indicates that the volume of aggregate weight loss in Los Angeles test is related to aggregate accumulation environment. The extent of aggregate abrasion resistance is lowest in talus medium and increases in alluvial fan and river environment, respectively. The difference in aggregate abrasion resistance in various areas result from geology process differences that applies to aggregates in various environment. The extent of caring particles in talus environment is very low and the type of movement is mass or sliding type in these media, micro-crack and weak parts remains within aggregates. The surface of micro crack is weak such that breaks easily in Los Angeles test due to the pressure results from the impact of aggregate, as well as the impact of steel ball on aggregate leading to aggregate breakages. Aggregates move more distances in alluvial fan and river. Aggregate strike together in riverbed and alluvial fan yielding to aggregates breakages from micro-cracks. As the movement distance increases, aggregates approach more to intact rock. During the particles move, the weathered and weak parts are damaged by aggregate abrasion to riverbeds and alluvial fan, and more resistant and harder aggregates remain. As the water current increases, the aggregates impact each other harder, more resistant micro-crack breakages and this change leads to decrease the weight loss in Los Angeles test.

KeyWord: river, alluvial fan, talus, aggregate, abrasion resistance, Damavand, Daneh Khoshk anticline

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