

**THE STUDY OF CONCRETE BEHAVIOUR PREPARED WITH CHEMICALLY
TREATED RECYCLE AGGREGATE: A REVIEW**Jignesh H. Solanki¹, Prashant K Bhuva², Vijay Kukadia³^{1,2,3} Noble Group of Institutions Junagadh

Abstract : Method to promote maximum recycled concrete aggregate (RCA) utilization for structural application is to minimize the adverse effect of RCA on concrete performance. The recycling of construction and demolition wastes has long accepted to have possibility of converse the waste of construction and demolition material to natural resources for saving the natural aggregate. In some nations it is a standard substitute for both construction and maintenance. Where there is scarcity of aggregate. This aims to make a potential treatment of RCA by using low concentration acid as an alternative method to produce high quality RCA for structural concrete application. The study about the effect of using different molarities of acid and age of soaking on property of RCA.

Keywords: Recycled concrete aggregate, low-concentration acid, treatment

1. INTRODUCTION

In recent years, the escalating urbanization has led to excessive demolition work and construction activities, which consequently resulted in the production of large quantities of construction and demolition (C&D) waste, especially concrete waste. A huge amount of C&D waste has become available a seriously significant impact on the environment and society. The great recycling of concrete waste was identified as the most feasible way to minimize the growing problem of waste disposal through landfills. The application of recycled aggregates is important in providing alternative material sources to reduce the dependence of the construction industry on natural aggregates. A critical curtailment in the sources of natural aggregates is becoming a worldwide problem, especially in the face of the development of major urban centers. Today, crushed concrete is available in large quantities, which results from the demolition of old structures and waste concrete from new structures. The current annual rate of generation of construction waste is 1,183 million tones worldwide. The land area required for filling this huge amount of waste is, comparable to the accumulation of waste. Therefore, recycling construction waste is vital, both in order to reduce the amount of open land needed for landfilling and to preserve environment through resource conservation. Also from the viewpoint of sustainable and green building technologies, the use of recycled aggregate (RA) in new concrete production has enlarged globally.

2. METHODS FOR TREATMENT OF RECYCLED AGGREGATES

In order to boost the quality of RA, several techniques have been developed in literature. However, these methods can be broadly categorized into two categories. The first category removes the loose mortar particle on the exterior and the second category modifies the aggregate surface. The loose mortar particle adhered to the surface can be removed by ultrasonic modify method, ball milling, or by heating at first and then rubbing. Presoaking RA in an acidic environment also carry away the adhered mortar from RA. Tam et al. Tried presoaking accession to remove the attached mortar on RA. They used different acids such as hydrochloric acid, sulfuric acid, and phosphoric acid in different concentrations, and obtained RA with better qualities. Also tried presoaking RA with low acid molarities for different treatment periods and resulted in a significant improvement in the strength RAC.

Modification on the aggregate surface (through coating binder evenly on its surface) increases the attach force between RA and new mortar. Pozzolanic materials such as fly-ash and silica fume are used as surface cover binders, expecting to enhance chemical and physical bonding due to pozzolonic reaction and mechanical action. Li et al. (2009) found that coating with silica fume and fly ash was most effective for strength growth of RAC and contributed the improvement to a maximum packing density due to wider distribution of double mineral additives. The study on the physiochemical reactions of cement paste around aggregate for NAC and RAC mixed with the normal mixing approach and the two-stage mixing approach by differential scanning calorimetry also reveals that the two-stage mixing approach is found to improve the affection of the RAC. Clearly indicated the weaker intertransitional zone (ITZ) between new cement paste and RA. Therefore, modification of the microstructure in the ITZ has been one of the great dealing with to improve properties of the RAC. By using a kind of two stage mixing approach and triple mixing approach ITZ and thus the properties of RAC can be improved. Tam and Tam (2008) developed improved two stage mixing approaches by adding silica fume into certain percentages RA in the premix procedure, named as two stage mixing approach (silica fume) (TSMAs) and adding silica fume and proportional amounts of cement into certain percentages of RA in the first mix, referred to as two-stage mixing approach

(silica fume and cement) (TSMAsc). The addition of silica fume and proportional cement content in the premix on TSMAs and TSMAsc can fill up the weak areas in the RA and thus develop a stronger interfacial layer around the aggregate and hence, a higher strength of the concrete can be obtained.

The effects of poly vinyl alcohol(PVA) impregnation on the development of the strength and durability properties of RAC and showed that there was not only an improvement in the mechanical properties of the PVA impregnated RAC, but also the shrinkage decreased, while the resistance to chloride-ion penetration increased. The application of these treatment techniques has significant impact on the virtual reality in terms of production free chloride ions and energy use. However, studied the surface modification of recycled aggregate concrete using bio deposition involving *Bacillus pasteurii* bacteria and obtained an improved quality of RA. Marinkovic et al. (2010) stated that, the total environmental impacts in terms of energy use, global warming, eutrophication, acidification, and photochemical oxidant creation depend on transport distances and type of transport. For transport distances of RA that are smaller than those of NA, the environmental impact of RAC and NAC production in terms of the studied impact categories is approximately the same and the benefit from recycling in terms of minimizing waste and natural mineral resources depletion is also gained. Though there are remarkable environmental impacts of these treatment techniques, these impacts assessment are not addressed extensively, since it falls beyond the scope of the present paper. While thoroughly researching the literature pertaining to treatment techniques for RA, it was found that there is very limited comparative study reported, so far, on the different methods of treatment techniques for recycled aggregate. Hence, in the present study, it is proposed to experimentally investigate on the effect of the treatment method (both chemical and mechanical) on the strength and performance of concrete prepared with treated RA. It is also intended to investigate the suitability of a particular method of treatment.



3. CONCLUSION

The use of low concentration HCl has the potential to remove the loose adhered mortar on RCA surface. The results show a linear correlation between the amount of mortar loss with the increase of the molarity of acid. However, the immersion time of RCA with acid did not have significant influence on the amount of mortar lost.

The properties of RCA have improved after treatment with acid immersion. The test results indicate marked improvements in density, water absorption, and mechanical strength of RCA after acid treatments as compared to untreated RCA. The acid treatments can effectively remove a great portion of weak cement mortar and certain loose substances from the RCA surface, and thus improving the physical properties of RCA. Presoaking recycled aggregate in H₂SO₄ is more efficient than HCl in removing the attached mortar of recycled aggregate. Hence, the properties of recycled aggregate as well as the recycled aggregate concrete are improved. The long term performance of recycled aggregate concrete evaluated in terms of water absorption and loss of weight on drying are improved by sulphuric acid and heating and scrubbing treatments.

4. REFERENCES

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