

Reduction of Setting time of GGBS based Geo-Polymer by the use of Borax

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Abstract—Utilization of alternate materials like GGBS based Geo-polymer reduces the dependence on the energy intensive materials like OPC. However, the use of Geo-Polymers is limited despite many good features of it, due to the fast setting time which is generally less than 30 minutes in most of the cases, as a result, this wonderful material is limited to lab testing and still not acceptable in realtime usage. This research makes a genuine effort to increase the setting time by using a catalytic poison like Borax.

Keywords— GGBS, Setting time, Borax.

I. INTRODUCTION

The use of Borax to reduce the setting time is not a new concept as it is used widely in delaying the baking time of Clay ceramics. An attempt is made for using BORAX to reduce the setting time in Geo-Polymers as the hardening process of Geo-Polymers are similar to Clay Ceramics except that Geo-Polymers can harden at room temperature.

II. MATERIALS AND METHODS

We have used the following materials for the carried out research

1. GGBS(JSW)
2. BORAX
3. Sodium Silicate
4. Sodium Hydroxide

All the above mentioned materials are lab grade except for GGBS.

It was decided that 5 Different concentrations of Borax will be used keeping the other parameters same referring to earlier literature.

III. MIXES

A mix design was created based on the previous literature available, following parameters were selected

1. GGBS weight was taken as 400g
2. GGBS/ Alkaline Liquid Ratio 1:1
3. Molarity of NaOH solution 3M
4. NaOH : Na₂SiO₃ ratio as 1:1
5. Borax was added in incremental dosage of 1% to 5% by weight of total solids in mix designated by M1 to M5

IV. RESULTS AND DISCUSSIONS

The mixes were made individually and checked for initial and final setting time as per IS standards using standard Vicat apparatus and moulds. The results obtained were as following

Sl no	Mix Designation	Initial Setting Time(Minutes)	Final Setting Time (Hours)
1	M1	15	20
2	M2	18	24
3	M3	25	32
4	M4	26	33
5	M5	26	35

V. CONCLUSIONS

By the obtained results it is clear that initial setting time is increasing by the increase in the content of BORAX in the mix. It was also observed that there is little time difference between initial and final setting, indicating a flash set without significant difference. It was also observed that 3% dosage was the optimum as any increase in addition of BORAX beyond 3% produced minimal increase in Initial and Final setting times.

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