ABSTRACT

The objective of this research was to study the influence of ground black rice husk ash (BRHA) in cement mortars under sulfate and chloride attacks. The BRHA received from electrical generating power plant using rice husk as fuel was ground by using the comparatively low cost grinding machine to obtain suitable physical properties. The tested properties included basic properties of ground BRHA, properties of mortar containing ground BRHA (flow table, strength index at the ages of 7 and 28 days and setting time) and sulfate resistance properties (expansion in terms of length change, weight loss and strength loss). The studied variables were the percentage replacements of ground BRHA by weight in Portland cement types I and V (0%, 10%, 20%, 30%, 40%, and 50%) and water-to-binder ratios conforming to the flow value of 110 ± 5%. The sulfate solutions were sodium sulfate (Na_2SO_4) and magnesium sulfate ($MgSO_4$) with the concentration of 5% by weight in accordance with the ASTM C 1012 standard. In addition, the penetration of chloride in mortars was conducted in accordance with the ASTM C 1152 and ASTM C 114 standards. The results were also compared to the results of Portland-pozzolan cement (high chloride resistance). The solution used was a sodium chloride (NaCl) with the concentration of 3% by weight.

From the tested results, it was found that the suitable time for grinding BRHA equals to 4 hours (the Blaine fineness equal to 5,400 cm^2/g; retaining on a sieve No. 325 of 7.01% by weight) in according with ASTM C 618 standard for pozzolanic materials.

For sulfate resistance properties, it was found that the expansions in terms of length change of mortar specimens in sodium sulfate solution were higher than those in magnesium sulfate. And mortar containing 20% ground BRHA by weight yielded the lower strength loss, weight loss and length change than the normal cement mortars. Moreover, increasing the percentage replacements of ground BRHA caused an adverse effect on sulfate resistance of mortar.

For chloride penetration test, it was found that the resistance to chloride penetration was depended on the percentage replacements of ground BRHA. At

the replacement levels of the ground BRHA of 10 - 50% by weight, the chloride penetration resistance appeared to be improved.