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Discussion

A discussion of paper “Laboratory assessment of alkali contribution by aggregates to concrete and application to concrete structures affected by alkali–silica reactivity[☆] by M.-A. Berube, J. Duchesne, J.F. Dorion and M. Rivest

Tang Mingshu^{*}

College of Materials Science and Engineering, Nanjing University of Technology, 5 Xin Mo Fan Road, Nanjing, Jiangsu 210009, China

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The results of this paper are very interesting and very important for design of new concrete structures. Particularly we should pay much attention on the significant conclusion that the amount of alkali released by aggregate may be varied from <0.1 to 12.7 kg/m^3 . It seems that there is no reason to doubt of the truth of alkali being released from aggregate and the amount can't be neglected. However, the question is whether the alkali released by aggregate “equivalent effectiveness” as the alkali released by cement clinker. The latter contains 60–65% CaO, consequently the products of hydration are saturated by CaO, such as $1.7\text{CaO}\cdot\text{SiO}_2\cdot 2.1\text{H}_2\text{O}$, C_4AH_{13} , $\text{C}_3\text{A}\cdot 3\text{CaSO}_4\cdot 32\text{H}_2\text{O}$ et al. It means that all the products of hydration of Portland cement are high “basicity”, the ratio of $\text{CaO}/\text{SiO}_2(\text{Al}_2\text{O}_3 \text{ et al.})$ is high enough so

that the alkali can't be detained in them. But the condition of release of alkali by aggregate is quite different. For example, when the potash feldspar ($\text{K}_2\text{O}\cdot\text{Al}_2\text{O}_3\cdot 6\text{SiO}_2$) releases the K_2O , the residue is Al_2O_3 and SiO_2 , thus, the residue may detain some alkali, unless these acidic oxides will be combined with CaO to form high basic products. In the field conditions of concrete structures, we don't know what degree of such chemical process can be finished. As comparison, the alkali released by mineral admixtures may not be “equivalent effectiveness” as that released by Portland cement. So far, the foregoing discussion illustrates that a further study on the “effectiveness” of alkali released by aggregate is necessary, especially it should prove whether it is “equivalent effectiveness” as that released by Portland cement.

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^{*} Tel.: +86-25-331-6755x3229; fax: +86-25-324-1922.

E-mail address: tangms@njuct.edu.cn (T. Mingshu).