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Discussion

A reply to the discussion by A. Demirbas of the paper "Performance of rice husk ash produced using a new technology as a mineral admixture in concrete"☆

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I would like to thank Mr. A. Demirbas for his interest in our article. His discussion (received from the journal editor) includes several statements that seem to have editorial problems, which makes it difficult to understand. Examples include: "I think the authors should be clarified the particle size of RHA", "Typically, to very fine particles increase ability to react with water and the plasticity", etc. I will address the comments of Mr. Demirbas based on what I think was meant by such statements.

The main point in the discussion of Mr. Demirbas is that the particle size of supplementary cementitious materials influences pozzolanic activity, time of setting, rate of strength development, and mixing characteristics and plasticity of concrete in the fresh state. He seems to argue that this should have been clarified in our article.

Regardless of the fact that the effect of the fineness of pozzolanic materials on the fresh and hardened properties of cement-based materials is now common knowledge (our paper can add little new information in this area), the focus of our paper was on comparing the performance of various rice husk ash (RHA) products on the basis of comparable mean particle size (MPS); the MPS of RHA was not a variable in our study. We ground the various RHA materials to an MPS of about 7 μm, which we thought balanced performance with the cost and time of grinding. Had we ground the RHA to a finer MPS, we would likely have observed a better performance. However, the grinding would have been lengthy and unpractical for large-scale production.

Focusing the discussion on the MPS alone, in the case of RHA, can be misleading. Although having mean particle sizes about 45 times larger than that of silica fume, some of the RHA products investigated in this study were able to outperform silica fume in various properties including compressive strength development. Unlike silica fume, which consists essentially of ultrafine spherical particles, RHA has a highly microporous structure that is responsible for its very high surface area, which often exceeds that of silica fume. Such high surface area of RHA allows its pozzolanic activity to compete with that of the much finer silica fume. Thus, our paper focused on surface-area-related issues instead of the MPS in discussing the differences in performance between various RHA products and silica fume.

In fact, the effect of particle size distribution of cementitious materials goes beyond the pozzolanic activity issues raised by Mr. Demirbas. In examining the laser diffraction particle size distribution of the various RHA products, our article [1] states "The Figure also shows that ground RHA is finer than cement and should be expected to play not only a pozzolanic role, but also a microfiller effect to enhance the particle packing density of concrete". The first author was among the early researchers who investigated, in a fundamental manner, the effect of ultrafine particles in concrete. Mr. Demirbas is refereed to a more comprehensive discussion of this issue published elsewhere [2,3].

Mr. Demirbas also makes a rather vague statement on the effect of particle size on mixing characteristics and plasticity of fresh concrete. I would like to refer him to an article published by Nehdi et al. [4] on the effect of ultrafine particles on the rheology of fresh concrete, which investigates this issue in detail. Our current paper, as stated earlier, examined the performance of RHA products having similar mean particle sizes. It was not intended to investigate the effect of varying the average particle size of RHA on fresh concrete properties.

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