

Correspondence

Comments on the paper “Effect of oily waste addition to clay ceramic”

Firstly, we would like to acknowledge Ceramics International for granting us the opportunity to answer to the severe criticisms made by C.M.F. Vieira and S.N. Monteiro.

In the manuscript entitled “Effect of Oily Waste Addition to Clay Ceramic”, C.M.F. Vieira and S.N. Monteiro present results of their study on some physical and mechanical properties of clay-based traditional ceramics containing an oily waste. Although their efforts on highlighting the advantages of using their waste form as partial raw material in the traditional ceramics industry is fairly sensible, and deserves attention from the international community, their disapproving criticism on our paper [Ceramics International 30 (2004) 99–104] is unreasonable, lacking a rather scientific foundation.

Before going through each of the points brought up by Vieira and Monteiro, we would like to draw attention to a few relevant issues. The waste form reported in Vieira’s manuscript is different from the one used in our investigation. The waste used in their work, a viscous liquid, is classified as “Class I” hazardous, the reason why Petrobras (Brazilian Oil Company) beneficiates this material by mixing it with an encapsulating substance. The resulting material after encapsulation is less toxic, thus classified as “Class II” non-inert waste. It is a powder, clay agglomerate, and is the one used in our paper. This rules out any straightforward comparisons between the results achieved in our works. The same issue applies to the different forming operations used, firing schedules, and even the type of mechanical tests used to impose a certain stress field on the as-fired specimens of distinct shapes and dimensions. On the basis of the Ceramics Processing field, those differences would lead to fired specimens with considerably distinct uniformity levels, and that would at least in part explain why our materials do not follow the trend of oily waste-containing ceramics as claimed by Vieira and Monteiro.

Regarding Vieira and Monteiro’s claims, a list of answers is provided below:

- (1) The term “complex variation” used in our paper is related to the overall variation of the properties investigated with both waste addition and firing temperature. The results clearly show an inversion of behaviour within a certain range of firing temperatures. As Vieira and Monteiro looked at the effect of only two firing temperatures in their manuscript, they were not able to verify such phenomenon.
- (2) In our paper, it was claimed that the decrease in Linear Shrinkage was more noticeable at higher firing temperatures. Their claim that at the lowest firing temperature applied (750 °C) the decrease in Linear Shrinkage was not significant would be relevant only if we were limited to one or two firing temperatures. However, as we applied a rather broad range of firing temperatures (750, 800, . . . , 1150 °C), our comments are concerned with the general trend clearly observed when the firing temperature is increased (for instance, even at 900 °C a significant decrease in Linear Shrinkage with waste addition was observed). Furthermore, their claim that the role of non-plastic components does not apply to their system is pointless when compared to our paper, as they use a different waste form. The chemical composition of their waste does not guarantee it contains the same amount of quartz and barite (BaSO_4) as in our work (for instance, the SiO_2 content of their waste is far lower than in ours).

They claim that quartz and barite might not be present in significant amounts in the compositions made in our work. However, evidence of the presence of such compounds can be found in the XRD traces for the batches prepared and for fired specimens, as well as shown on a SEM image. Exhaustive use of these complementary techniques confirmed the presence of quartz and barite in our waste form, as-mixed batches and fired specimens.

Vieira and Monteiro also pointed out a “serious” misinterpretation in our paper with the Water Absorption values. We stated that, according to a Brazilian Standard for facing bricks and ceramic blocks, waste-containing bodies would fit the requirements after firing

at temperatures above 750 °C. This can be seen in Fig. 3 of our paper for higher waste-containing bodies at temperatures as low as 800 °C. Another “seriously” misleading statement they made about our work is that, regarding the use of waste-free clay formulations for the production of standardised ceramic wares using local industrial facilities, our clay would not meet the Standard’s requirements. It is well known that the Ceramic Industry in Campos dos Goytacazes, RJ, Brazil calls for significant technological input in order to upgrade the use of the local clay quarries. Actually, we did not express any aspiration to use the raw clay for the production of any specific ceramic ware, as it was not the aim of our paper.

- (3) The comments they made on the Mechanical Strength data of our paper is not consistent. It is clear from Fig. 5 of our paper that the Compressive Strength values decreases with waste addition. Although such behaviour is not very clear for the firing temperature of 750 °C, and for the batch containing 5 wt.% waste fired at 1150 °C, their conclusions stating that our results failed to show any relevant effect caused by the waste addition on the mechanical strength of clay ceramics is incorrect.
- (4) Their criticism regarding the quartz content in the clay and the waste form is based on chemical compositions rather than mineralogical compositions. This assumption is not acceptable and requires further

consideration. Furthermore, their analysis completely ignores the effect of those coarse, non-plastic components on the forming operation, leading to green compacts of different packing densities and levels of uniformity.

Finally, we would like to assure that our commitment with the scientific approach used in our paper was beyond any attempt to either rule out or endorse the wide use of any petroleum waste material in clay-based ceramics. Indeed, as Vieira and Monteiro belong to the same institution and department as Holanda, J.N.F., the harshness of their criticisms lacking consistent scientific basis makes the whole point of their intention to discuss our investigation questionable.

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