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Natural clay substitution by calamine processing wastes to manufacture fired bricks

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**Abstract**

This paper provides an efficient alternative way to conserve natural clays and to reduce both fired bricks costs production and wastes amounts generation. It aims to substitute natural clay by treated calamine processing wastes (TCPMT) to manufacture value added fired bricks. Different mixes containing up to 40% of TCPMT were pressed, dried and fired at various temperatures: 900, 950, 1000 and 1050°C. The fired bricks were characterized for their physical, mechanical, mineralogical, microstructural, environmental and durability properties. The results show that the increase of temperature allows the enhancement of mechanical strength, the reduction of water absorption due to the decrease of accessible pores amount and the enhancement of potential contaminants immobilization. The mechanical strength of bricks decreases with the addition of TCPMT due to the increased formation of pores and the apparition of some coarse grains which are considered as regions of weakness of the studied bricks. The leaching behavior of reference and selected optimum bricks, assessed according to a tank leaching test, shows that almost toxic elements; Pb, Zn, As, Cr, Mo, Ba, Cd and Cu are immobilized in the sintered bricks. Finally, the experimental approach outcomes show the possibility to produce bricks containing up to 30 wt.% of TCPMT with the required engineering and environmental properties when fired at 1050°C.

**Keywords:** Calamine wastes; sintered bricks; industrial ecology; microstructure; metals immobilization;

**Abbreviations:** TCPMT, treated calamine processing mine tailings; RM, reference material; LOI, loss on ignition; TCLP, toxicity characteristic leaching procedure; DL, detection limit; BMD, Building material Decree; EPA, environmental protection agency.

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