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EPS RHA Concrete Bricks – A New Building Material

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ABSTRACT

Reuse of agricultural wastes and industrial by-products for building materials has been gaining popularity in the recent years. Agricultural waste material; namely rice husk ash (RHA), and industrial by-product; namely expanded polystyrene beads (EPS) are discarded in large amounts globally, causing increased environmental problems. Therefore, this paper introduces innovative efforts of the combined use of RHA and EPS wastes for the production of EPS RHA lightweight concrete bricks. Results showed that the commercial development of EPS RHA bricks is not only highly promising but also effectively sequestering the accumulation of these waste materials.

KEYWORDS: Renewable material, Solid waste, Lightweight concrete brick, Compressive strength, Sorptivity, Thermal conductivity.

INTRODUCTION

Nowadays, clay bricks are considered one of the most important building materials used to construct walls for buildings. Due to the unsustainable mining of clay soil for clay brick making, cement bricks have been introduced into the industry providing more alternatives. However, the production of cement bricks consumes an enormous amount of cement. Besides, the production of cement is not environmentally friendly. The manufacturing of cement is not only a high energy consuming process, but the production of each tonne of cement releases approximately 1 ton of carbon dioxide (CO_2) into the environment due to the calcinations of the raw materials and the combustion of fuels (Malhotra, 2004). In light of the economic benefits, conservation of natural resources, energy saving and environmental friendliness, the use of alternative materials from waste products has become the main focus of engineers and researchers.

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Rice Husk Ash (RHA) is an agricultural waste material which possesses excellent pozzolanic activity (Zhang and Malhotra, 1996). It is obtained by burning rice husk to remove volatile organic carbon such as cellulose and lignin. Annually, approximately 600 million tons of rice paddy is produced (Chandrasekhar et al., 2003). For every 1000 kg of paddy milled, about 200 kg of husk is produced, and when this husk is burnt, about 40 kg of RHA is generated (Cook, 1986). RHA has 90–95% amorphous silica (Metha, 1992). It is highly porous, lightweight and has a high surface area (Della et al., 2002). Many previous researches showed that RHA can be used successfully in other building materials such as bricks and blocks without any degradation in the quality of products (Nasly and Yassin, 2009; Rahman, 1988).

Besides the strength, the lightweight property of the building materials is an important parameter which has challenged engineers and researchers today to come up with durable lightweight building materials. The conventional method of producing lightweight concrete is by adding lightweight aggregates to the concrete