Adobe bricks reinforced with paper & pulp wastes improving thermal and mechanical properties

Muñoz P.

Letelier V.

Muñoz L.

Bustamante M.A.

Soil-based building material has been used since ancient times but lately it has been mainly considered for restoration purposes of traditional architecture instead of an eco-friendly construction material for new buildings. However, the promotion of a more sustainable architecture has recently led to look towards adobe or rammed earth, among others. Because of the high impact of concrete and the fired clay brick industry, mainly due to the use of clinker and the firing process, respectively, adobe may highly reduce the ecological footprint of conventional construction and building materials. In addition, the use of fibers for adobe reinforcement has been also highlighted as a key factor for improving adobe performance. Obviously, when residues successfully replace such fibers the ecological footprint may be reduced even more. Thus, this research focuses on the assessment of adobe reinforced with paper and pulp industry residues (PPR) with the aim of demonstrating the feasibility of this construction material. Several series have been made by varying the replacement percentage up to 20% and technological properties and toxicity have been assessed. It is concluded that compressive strength may be improved up to 190% while thermal conductivity is reduced approx. 30% for 12.5% of PPR replacement. Besides, adobe meets standards related to water resistance and toxicity values.

Adobe

Compressive strength

Earth block

Modulus of rupture

SAET

Specific heat

Thermal conductivity

Toxicity

Architecture

Brick

Brickmaking

Compressive strength

Construction

Ecology

Paper and pulp mills

Pulp

Reinforcement

Thermal conductivity

Toxicity

Conventional constructions

Eco-friendly construction

Ecological footprint

Sustainable architecture

Technological properties

Thermal and mechanical properties

Traditional architecture

Water-resistances

Paper and pulp industry

Brick

Compression Strength

Construction

Ecology

Reinforcement