UTILIZATION OF WASTE GLAZED TILES AS A RAW MATERIAL/ADDITIVE

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Abstract

To find alternative environmental friendly methods for disposing waste glazed tiles, a detailed scientific study was carried out on evaluating techno-economical feasibility of utilizing waste glazed tiles as a raw material/ additive. Economical feasibility of size reduction of waste glazed tiles and technical feasibility of utilizing ceramic tile dust as non-black mineral filler in rubber were studied in this regard. Pilot-scale hammer mill and pot mill were utilized for size reduction process. Particle size distribution was analyzed according to standard testing methodologies by use of standard sieve analyzer and particle size analyzer. Rubber compounding was done for three master batch designs by use of pilot scale internal mixture having 1 kg capacity and two roll mill. Curing characteristics of the test samples and physical properties including hardness, tensile strength, tear strength and abrasion were analyzed. Moreover, literature review and baseline survey were carried out to collect information on waste tile generation index, available waste tile management practices, required particle size ranges to use waste glazed tiles as a raw material/ additive etc.

Results of the pilot studies revealed that use of ceramic floor tile waste as recycled aggregate in concrete production and application of this waste (ceramic tile dust) as non-black mineral filler in natural rubber is both technically and economically feasible in Sri Lanka. However, utilizing this waste as an alternative raw material in cement industry for clinkerization is not technically feasible for the currently available only cement kiln at Puttalam, Sri Lanka.

Key words: rejected ceramic tiles, recycling ceramic waste aggregate, recycling ceramic waste dust, size reduction cost of ceramic tiles, ceramic tile dust as filler in rubber

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To my beloved Amma (Kusum) and Thaththa (Sarath)

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List of Abbreviations

AFR	Alternative Fuels And Raw Materials
Al_2O_3	Aluminium oxide
AR	Alumina Ratio
B_2O_3	Boron trioxide
BAT	Best Available Technologies
CaO	Calcium oxide
CCWS	Concrete Ceramics Waste Slab
CENTEC	Centre of Technical Excellence for Ceramics in Sri Lanka
Cl^-	Chloride
CO_2	Carbon dioxide
EEPEx	Enhancing Environmental Performance in key Export Sectors
EIA	Environment Impact Assessment
Fe_2O_3	Iron(III) oxide
FTWA	Floor Tile Waste Aggregate
FTWD	Floor Tile Waste Dust
ITI	Industrial Technology Institute
K_2O	Potassium oxide
L.O.I.	Loss on ignition
LSF	Lime Saturation Factor
MgO	Magnesium oxide
Mn_2O_3	Manganese oxide
Na_2O	Sodium oxide
P_2O_5	Phosphorus pentoxide
PSD	Particle Size Distribution
R& D	Research and Development
SiO_2	Silicon dioxide
Si-O-H	Silanols
SLINTEC	Sri Lanka Institute of Nanotechnology
SMA	Stone Mastic Asphalt

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SO_3	Sulfur trioxide
SR	Silica Ratio
SrO_2	Strontium oxide
TiO_2	Titanium dioxide
XRD	X-ray diffraction
ZNO	Zinc oxide
ZrO_2	Zirconium dioxide

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