

**SUITABILITY OF USING OFFSHORE SAND SLUDGE
AS A FILLER MATERIAL FOR TILE ADHESIVE
PRODUCTION**

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Master of Science in Materials Science

Department of Materials Science and Engineering

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree

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DECLARATION

I confirm that this thesis is my own work and does not include, without proper acknowledgment, any material previously submitted for a Degree or Diploma at any other university or institution of higher education. To the best of my knowledge, it does not contain any material previously published or written by another person, except where due acknowledgment has been made within the text.

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I certify that the above candidate has conducted the research work presented in this Master's thesis under my supervision. I further confirm that the declaration made by the student above is accurate and true to the best of my knowledge.

Name of Supervisor: S.P. Guluwita

Signature of the Supervisor:

Date:

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ABSTRACT

Offshore sand sludge (OSS) is a byproduct that is continuously collected with backwash water during offshore sand processing. OSS predominantly comprises fine sand grains and shell fragments. Chemical composition analysis and property evaluation have confirmed the presence of beneficial compounds and minimal contaminants, which indicates its potential for the development of value-added products. The particle size distribution and shell content of OSS are key factors determining its suitability as a replacement for conventional quartz and dolomite fillers in tile adhesives. In addition, the consistent particle size distribution in OSS enhances its feasibility for production processes. Tile adhesive mixtures were formulated and evaluated to identify the appropriate particle range for production. The study focused on two particle ranges which are below 0.6 mm and particles between 0.125 mm and 0.6 mm. Performance testing of the initial tile adhesive formulations were demonstrated that both particle ranges were suitable for use as fillers. However, below 0.6 mm used adhesive exhibited better physical properties due to improved packing factors. Despite this, neither formulation met the open-time requirements, which necessitated adjustments to the adhesive formulation. Subsequently, six additional formulations were tested to address the observed performance gaps in the initial mixtures. Additives and water/powder ratio adjustments were made to meet the specified requirements in accordance with international norms. The modified formulations were exhibited properties that exceeded the specified limits for the C2 category as per the ISO 13007-2. Furthermore, the formulation using below 0.6 mm OSS filler exhibited the best overall performance compared to all other mixtures. The study concludes that OSS can be effectively utilized as a filler material in tile adhesive manufacturing. The proposed formulation was thoroughly investigated and evaluated, which confirms its potential for industrial applications.

Keywords: OSS; Filler; Tile Adhesive; Formulation

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LIST OF ABBREVIATIONS

Abbreviation	Description
NBRO	National Building Research Organisation
SLLDC	Sri Lanka Land Development Corporation
SLINTEC	Sri Lanka Institute of Nanotechnology
EPA	Environment Protection Agency
OSS	Offshore Sand
RDP	Redispercible Polymer Powder
HPMC	Hydroxypropyl Methyl Cellulose
VAE	Vinyl Acetate-Ethylene
VOC	Volatile Organic Compound
OPC	Ordinary Portland Cement
FTIR	Fourier Transform Infrared Spectroscopy
XRF	X-ray Fluorescence
PSD	Particle Size Distribution
LOI	Loss on Ignition
SCN ⁻	Standardized thiocyanate

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