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

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Master of Science in Materials Science

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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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Name of Supervisor: S.P. Guluwita

Signature of the Supervisor: Date:

ACKNOWLEDGEMENT

I wish to express my heartfelt gratitude and sincere appreciation to my supervisor, Mr. S.P. Guluwita, Senior Lecturer at the Department of Materials Science and Engineering, Faculty of Engineering, University of Moratuwa, for his invaluable guidance, encouragement, patience, and the generous time he dedicated to supporting me throughout this research.

I wish to extend my profound gratitude to Emeritus Prof. S.M.A. Nanayakkara for his invaluable guidance and unwavering support throughout my research journey. His profound knowledge, insightful advice, and dedication to academic excellence have been instrumental in shaping the direction and quality of this study.

I am deeply grateful to Eng. (Dr.) Asiri Karunawardena, Director General of the National Building Research Organization (NBRO), and Mrs. (Eng.) S.S.K. Muthurathna, Director of the Building Materials Research and Testing Division, NBRO, as well as the management staff of NBRO, for their financial support and for providing the facilities necessary to carry out this research.

I also extend my profound gratitude to the Department of Materials Science and Engineering, University of Moratuwa, Sri Lanka, and the Building Materials Research and Testing Division, NBRO, Sri Lanka, for offering access to the testing facilities and other resources required for this study.

Finally, I would like to thank my family and loved ones for their unwavering support, encouragement, and understanding throughout this journey. Their presence has been my strength during this endeavor.

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

LIST OF APPENDICES