

PREFACE

Rapid global population growth and development in the civil infrastructure have arisen the need of developing knowledge to enhance the strength properties of the existing soils or waste for civil and geotechnical engineering purposes. Since the beginning of human civilization, several different techniques and materials have been employed to stabilize the soil/waste. The use of a conventional method such as cement binders are associated with many environmental problems, so materials described as environmentally friendly called microbial biopolymers have been developed for application in engineering purposes.

Over the years, environmental issues have forced engineers and researchers to focus on new methods that use biological processes in soil/waste stabilization techniques. This research focuses on the application of biopolymer, xanthan, and guar gum, to bauxite residue and coal mine overburden waste to enhance mechanical and hydraulic properties. The primary potential application of waste stabilization with biopolymer is the construction of various engineered structures such as roads, embankments, impervious barriers, etc., to control erosion, permeability and enhance biodegradation of contaminants as they seep through the structure.

The thesis entitled” **A Study on utilization potential of microbial biopolymer treated wastes in civil engineering**” comprises five chapters. The research begins with an introduction, which briefly describes biopolymer, industrial waste (bauxite residue), and coal mine overburden waste in **Chapter 1**. The literature review on the potential application of biopolymer in stabilizing soil/waste is advocated by numerous researchers for various engineering purposes. This chapter also covers the scope and objective of this study.

In **Chapter 2**, description of the materials used in this research and their physical and chemical properties. This chapter also explains the preparation of samples and its methodology for the various test performed in this study.

The results and discussions of all the laboratory tests performed on bauxite residue and coal mine overburden waste treated with xanthan and guar gum is presented in **Chapter 3**. The experiments include the Compaction test, Tri-axial compression test, Unconfined compressive, Durability test (Freezing and thawing), Permeability test, Colorimeter analysis, Mineralogical and morphological test have been performed at different biopolymer concentrations and curing time.

Chapter 4 describes the potential application of biopolymer treated waste in civil and geotechnical engineering. A case study on the biopolymer application for slope and surface stabilization is reviewed. This chapter also explains the environmental, economic, social benefits, and future challenges of biopolymer application.

Finally, **Chapter 5** includes a conclusion based on all the experiments and discussion.