

# PRELIMINARY STUDY ON THE BIODEGRADABILITY OF NATURAL AND SYNTHETIC RUBBER GLOVES USED IN HEALTHCARE

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Natural and synthetic rubber gloves are used in various fields such as healthcare, laboratories and industries. The disposal of these types of single-use gloves after use in landfills causes serious environmental impact as these materials do not decompose easily. In this study, the environmental implications in disposal of natural rubber (NR) gloves and synthetic rubber gloves such as neoprene (CR), isoprene (IR), nitrile (NBR), vinyl (PVC) and ethylene-vinyl acetate (EVA) gloves were studied using mechanical properties. Dumbbell shaped test samples were cut from each type of gloves and buried in soil for a period of 360 days. After 180 days in soil, NR gloves showed a significant loss of tensile properties and thickness compared with synthetic gloves. These findings were supplemented by measurements of Fourier Transform Infrared - Attenuated Total Reflectance (FTIR-ATR), crosslink density, swelling behavior and thermogravimetric analysis (TGA). Functional group alterations detected in NR gloves using FTIR indicated chain scission. TGA studies also supported substantial degradation of NR gloves. Higher population density of bacteria was recorded in NR gloves when compared with synthetic gloves.

**Keywords:** Biodegradation, Fourier Transform Infrared - Attenuated Total Reflectance, Functional group, Tensile strength, Thermogravimetric analysis

## INTRODUCTION

Latex and synthetic disposable gloves are often worn by health care professionals for hygiene and prevention of contamination. The latest global disposable gloves market size is estimated at USD 9.57 billion which might increase at a compounded annual growth rate of 8.4 per cent from 2024 to 2030 (Grand View Research, 2024). The increasing use of different types of gloves and their disposal by land fillings and

incineration raise concerns about their environmental impact.

The Para rubber tree *Hevea brasiliensis* is the main source of natural rubber latex (NRL), which is a colloidal dispersion of *cis*-1,4-polyisoprene (Guerra *et al.*, 2021). NR is an excellent natural resource owing to its high tensile strength, resilience and higher stretchability (Cornish, 2014; Boonying *et al.*, 2022). On the other hand, synthetic rubber is manufactured using raw materials