



Proceeding Paper

# Mechanisms of Biodeterioration of Structural Materials by *Streptomyces* spp.: A Review <sup>†</sup>

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**Abstract:** The processes of microbial damage to materials lead to a number of environmental problems. To prevent the development of eco-trophic corrosively active groups of micro-organisms, “green” biocides/inhibitors are being developed. Actinobacteria of the genus *Streptomyces* are actively studied from the point of view of usefulness/harmfulness in relation to human activity, in particular, in the processes of microbial damage to materials. To summarize the results of available scientific research and reviews devoted to the participation and supposed mechanisms of structural materials damage caused by streptomycetes, the presented study was performed. The possible role of streptomycetes in the biodeterioration of structural materials was speculated. The obtained data indicate the need for further studies on streptomycetes as participants in the corrosion process, with special attention to their production of secondary metabolites and nanoparticles of metal and metal oxides with antimicrobial and inhibitory properties, which will contribute to the expansion of the list of “green” biocides/inhibitors.

**Keywords:** Actinobacteria; construction materials; “green” biocides/inhibitors; mechanisms of biodeterioration; *Streptomyces*



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## 1. Introduction

The processes of the biodegradation of materials, harmful from the point of view of practical human activity, are considered through their biodamage, which should be prevented and eliminated. Material deterioration leads to a number of environmental problems [1]. Biocides/inhibitors used to protect against corrosion, including microbial corrosion, are often toxic compounds [2,3]. Eco-friendly “green” biocides/inhibitors are being developed today based on the requirements of ensuring the preservation of the quality of the environment [3–5]. It is known that representatives of the genus *Streptomyces* play an active part in the destruction of materials: wall paintings suffer from the growth and colonization of *Streptomyces* [6,7], the biodegradation of rubber latex occurs with the participation of *Streptomyces* labedae isolated from the soil [8], and streptomycetes have been isolated from damaged film and oil-bitumen coatings of gas pipelines and underground tanks [9,10]. At the same time, sulfate-reducing and thione bacteria are considered the main corrosively active groups of micro-organisms [10–12]. Streptomycetes are considered as heterotrophic bacteria companions of the main groups of material damagers [13].

A study of the diversity, richness, and composition of microbial communities on a steel surface in marine conditions showed that Proteobacteria accounted for 83.1% of the

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## **Table of Contents Biodeterioration Of Materials Volume 1**

1. Understanding the eBook Biodeterioration Of Materials Volume 1
  - The Rise of Digital Reading Biodeterioration Of Materials Volume 1
  - Advantages of eBooks Over Traditional Books
2. Identifying Biodeterioration Of Materials Volume 1
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Biodeterioration Of Materials Volume 1
  - User-Friendly Interface
4. Exploring eBook Recommendations from Biodeterioration Of Materials Volume 1
  - Personalized Recommendations
  - Biodeterioration Of Materials Volume 1 User Reviews and Ratings
  - Biodeterioration Of Materials Volume 1 and Bestseller Lists
5. Accessing Biodeterioration Of Materials Volume 1 Free and Paid eBooks
  - Biodeterioration Of Materials Volume 1 Public Domain eBooks
  - Biodeterioration Of Materials Volume 1 eBook Subscription Services
  - Biodeterioration Of Materials Volume 1 Budget-Friendly Options
6. Navigating Biodeterioration Of Materials Volume 1 eBook Formats

- ePub, PDF, MOBI, and More
  - Biodeterioration Of Materials Volume 1 Compatibility with Devices
  - Biodeterioration Of Materials Volume 1 Enhanced eBook Features
7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Biodeterioration Of Materials Volume 1
    - Highlighting and Note-Taking Biodeterioration Of Materials Volume 1
    - Interactive Elements Biodeterioration Of Materials Volume 1
  8. Staying Engaged with Biodeterioration Of Materials Volume 1
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Biodeterioration Of Materials Volume 1
  9. Balancing eBooks and Physical Books Biodeterioration Of Materials Volume 1
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Biodeterioration Of Materials Volume 1
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Biodeterioration Of Materials Volume 1
    - Setting Reading Goals Biodeterioration Of Materials Volume 1
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Biodeterioration Of Materials Volume 1
    - Fact-Checking eBook Content of Biodeterioration Of Materials Volume 1
    - Distinguishing Credible Sources
  13. Promoting Lifelong Learning
    - Utilizing eBooks for Skill Development
    - Exploring Educational eBooks
  14. Embracing eBook Trends
    - Integration of Multimedia Elements
    - Interactive and Gamified eBooks

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