


Article
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Abstract: A single paragraph of about 200 words maximum. For research articles, abstracts should give a pertinent overview of the work. We strongly encourage authors to use the following style of structured abstracts, but without headings: (1) Background: place the question addressed in a broad context and highlight the purpose of the study; (2) Methods: describe briefly the main methods or treatments applied; (3) Results: summarize the article's main findings; (4) Conclusion: indicate the main conclusions or interpretations. The abstract should be an objective representation of the article, it must not contain results which are not presented and substantiated in the main text and should not exaggerate the main conclusions.

Keywords: keyword 1; keyword 2; keyword 3 (List three to ten pertinent keywords specific to the article; yet reasonably common within the subject discipline.)

1. Introduction

A promising alternative to conventional technology for the removal of aqueous Pb(II) is bioremediation, where organisms are used to remove or detoxify the heavy metal [1]. Bioremediation is attractive due to the variety of biomaterials applicable (such as algae, fungi, plants, and bacteria) and its potential for low cost and high efficiency operation at low Pb(II) concentrations [2]. Pb(II) removal with organisms has mostly been limited to sorption with biomass [3], the use of plants for phytoextraction [4], and fungi for mycelial biosorption [5]. Some microorganisms have been discovered that reduce the bioavailability and toxicity of Pb(II) by precipitating it out as an insoluble complex.

A consortium of bacteria has been isolated from lead-contaminated soil at a battery recycling plant in Gauteng, South Africa, that has been shown to remove Pb(II) from solution [6]. This lead-resistant consortium has been the subject of many investigations in the pursuit of better understanding the removal mechanisms and possible implementations in the bioremediation and biorecovery of lead in industrial effluent. This includes studies on the influence of lead concentrations [6,7], substrate concentration [6,8], precipitate identification [9,10], influence of other divalent heavy metals [11].

Consortium precipitates PbO aerobic and PbS + PbO anaerobic, oxidation-reduction mechanism where Pb(II) acts as terminal electron acceptor [12]

Modelled with fast and then slow stages [13], where the fast has been attributed to biosorption [14]. The role of biosorption also displayed in dead bacteria [15] [16] [17]

The chemical composition of bacteria surfaces for both Gram-positive and Gram-negative bacteria are rich in negatively charged functional groups that result in an overall negative surface charge and facilitate the attraction of positively charged metal cations like ionic lead [18]. These functional groups also allow for chemisorption to take place, where hydrogen ions are exchanged for Pb(II) ions (Lu et al., 2012) [19]. Chemisorption

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not only prevents lead from entering cells, but Functional group complexation can be a prominent adsorption mechanism for some bacteria that use it to concentrate terminal electron accepting ions on the cell wall surface [20]

Several subterranean anaerobic bacteria have been reported to respire using a range of terminal electron acceptors, including heavy metal pollutants [20]. Respiration involving the reduction of soluble oxidised-metals can lessen the mobility of the metal. [21] [22] [23] [24] [25]

Lead is a big problem

A consortium has been found: consortium properties like performance: chapter + carla + all the cets. Lateral citation fest.

Is surface complexation a mechanistic step or is? Does rxn happen on surface?

The introduction should briefly place the study in a broad context and highlight why it is important. It should define the purpose of the work and its significance. The current state of the research field should be reviewed carefully and key publications cited. Please highlight controversial and diverging hypotheses when necessary. Finally, briefly mention the main aim of the work and highlight the principal conclusions. As far as possible, please keep the introduction comprehensible to scientists outside your particular field of research.

2. Materials and Methods

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Research manuscripts reporting large datasets that are deposited in a publicly available database should specify where the data have been deposited and provide the relevant accession numbers. If the accession numbers have not yet been obtained at the time of submission, please state that they will be provided during review. They must be provided prior to publication.

Interventionary studies involving animals or humans, and other studies require ethical approval must list the authority that provided approval and the corresponding ethical approval code.

This is an example of a quote.

3. Results

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation as well as the experimental conclusions that can be drawn.

3.1. Subsection

3.1.1. Subsubsection

Bulleted lists look like this:

- First bullet;
- Second bullet;
- Third bullet.

Numbered lists can be added as follows:

1. First item;
2. Second item;
3. Third item.

The text continues here.

88 3.2. Figures, Tables and Schemes

89 All figures and tables should be cited in the main text as Figure 1, Table 1, etc.



Figure 1. This is a figure. Schemes follow the same formatting. If there are multiple panels, they should be listed as: **(a)** Description of what is contained in the first panel. **(b)** Description of what is contained in the second panel. Figures should be placed in the main text near to the first time they are cited. A caption on a single line should be centered.

Table 1. This is a table caption. Tables should be placed in the main text near to the first time they are cited.

Title 1	Title 2	Title 3
Entry 1	Data	Data
Entry 2	Data	Data

90 Text.

91 Text.

92 3.3. Formatting of Mathematical Components

This is the example 1 of equation:

$$a = 1, \quad (1)$$

93 the text following an equation need not be a new paragraph. Please punctuate equations
94 as regular text.

95 This is the example 2 of equation:

$$a = b + c + d + e + f + g + h + i + j + k + l + m + n + o + p + q + r + s + t + u + v + w + x + y + z \quad (2)$$



Figure 2. This is a wide figure.

96 Please punctuate equations as regular text. Theorem-type environments (including
97 propositions, lemmas, corollaries etc.) can be formatted as follows:

98 **Theorem 1.** *Example text of a theorem.*

99 The text continues here. Proofs must be formatted as follows:

100 **Proof of Theorem 1.** Text of the proof. Note that the phrase “of Theorem 1” is optional
101 if it is clear which theorem is being referred to. □

102 The text continues here.

103 4. Discussion

104 Authors should discuss the results and how they can be interpreted from the
105 perspective of previous studies and of the working hypotheses. The findings and their
106 implications should be discussed in the broadest context possible. Future research
107 directions may also be highlighted.

108 5. Conclusions

109 This section is not mandatory, but can be added to the manuscript if the discussion
110 is unusually long or complex.

111 6. Patents

112 This section is not mandatory, but may be added if there are patents resulting from
113 the work reported in this manuscript.

114 **Author Contributions:** For research articles with several authors, a short paragraph specifying
115 their individual contributions must be provided. The following statements should be used
116 “Conceptualization, X.X. and Y.Y.; methodology, X.X.; software, X.X.; validation, X.X., Y.Y. and
117 Z.Z.; formal analysis, X.X.; investigation, X.X.; resources, X.X.; data curation, X.X.; writing—
118 original draft preparation, X.X.; writing—review and editing, X.X.; visualization, X.X.; supervision,

X.X.; project administration, X.X.; funding acquisition, Y.Y. All authors have read and agreed to the published version of the manuscript.”, please turn to the [CRediT taxonomy](#) for the term explanation. Authorship must be limited to those who have contributed substantially to the work reported.

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Sample Availability: Samples of the compounds ... are available from the authors.

Abbreviations

The following abbreviations are used in this manuscript:

MDPI	Multidisciplinary Digital Publishing Institute
DOAJ	Directory of open access journals
TLA	Three letter acronym
LD	Linear dichroism

165 Appendix A

166 Appendix A.1

167 The appendix is an optional section that can contain details and data supplemental
 168 to the main text—for example, explanations of experimental details that would disrupt
 169 the flow of the main text but nonetheless remain crucial to understanding and reproduc-
 170 ing the research shown; figures of replicates for experiments of which representative
 171 data are shown in the main text can be added here if brief, or as Supplementary Data.
 172 Mathematical proofs of results not central to the paper can be added as an appendix.

Table A1. This is a table caption. Tables should be placed in the main text near to the first time they are cited.

Title 1	Title 2	Title 3
Entry 1	Data	Data
Entry 2	Data	Data

173 Appendix B

174 All appendix sections must be cited in the main text. In the appendices, Figures,
 175 Tables, etc. should be labeled, starting with “A”—e.g., Figure A1, Figure A2, etc.

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