Ex Situ Bioremediation of Contaminated Soils: An Overview of Conventional and Innovative Technologies

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Bioremediation as a sustainable alternative to chemical-physical processes is an attractive solution for soil decontamination and renewal of polluted sites. Depending on the site characteristics and target treatment requirements for the decontaminated soil, in situ or ex situ technologies are employed. Ex situ technologies are advantageous when a safe and effective intervention is required (i.e., in the presence of severe contamination of highly hazardous compounds).

In this review, conventional and innovative ex situ technologies for soil bioremediation are presented. For each one the principle of operation and recent applications are reported. In addition, strategies to improve their efficiency are explored. Finally, the possibility of making these technologies more competitive by indicating research needs for their future development is highlighted.

KEY WORDS: composting, ex situ technologies, landfarming, slurry bioreactors, soil bioremediation, two-phase partitioning bioreactors

1. INTRODUCTION

The contamination of soil arising from industrial activity, high intensity farming, and poor landfill disposal practices has historically occurred without adequate regard for their lasting environmental legacy. Increased awareness