

APPLICATION OF THE ELECTROCHEMICAL TREATMENT METHOD FOR THE REMEDIATION OF PETROLEUM HYDROCARBONS FROM CONTAMINATED SOILS

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Rezumat. Solurile contaminate cu poluanți toxici și persistenți prezintă potențiale pericole semnificative pentru mediu și sănătatea umană. Problema solurilor poluate și alegerea celei mai adecvate strategii de remediere reprezintă o preocupare actuală în întreaga lume. Ca urmare a activităților industriale aferente sectorului energetic (în principal din industria extractivă), contaminanții de interes la nivel național și internațional în sensul remedierii siturilor contaminate sunt hidrocarburile petroliere. În acest context, scopul principal al prezentei cercetări a fost evaluarea gradului de remediere a acestor contaminanți în timpul aplicării metodei electrochimice de remediere. Solul contaminat cu țiței, supus remedierii, este din județul Teleorman, comuna Siliștea, zonă în care sunt amplasate sonde de extracție a petrolului și a gazelor naturale. În urma aplicării procesului electrochimic s-a observat scăderea nivelului concentrației de TPH de la o concentrație inițială de 5000 mg/kg s.u. la 2228 mg/kg s.u., obținându-se un procent de remediere de 55%, după o perioadă de 14 zile. În consecință, se poate aprecia că procesul electrochimic aplicat în vederea remedierii unui sol contaminat cu produse petroliere este avantajos prin prisma duratei scurte de timp, însă metoda prezintă și unele dezavantaje precum consumul de energie și implicit costuri semnificative aferente cu aceasta.

Abstract. Contaminated soils with toxic and persistent pollutants pose significant potential hazards to the environment and human health. The problem of polluted soils and choosing the most appropriate remediation strategy is a current concern throughout the world. As a result of the industrial activities related to the energy sector (mainly from the extractive industry), the contaminants of interest at the national and international level in terms of the remediation of contaminated sites are petroleum hydrocarbons. In this context, the main aim of the present research was to evaluate the degree of remediation of these contaminants during the application of the electrochemical remediation method. The soil contaminated with crude oil,

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subject to remediation, is from Teleorman county, Siliștea commune, an area where oil and natural gas extraction wells are located. Following the application of the electrochemical process, a decrease in the TPH concentration level was observed from an initial concentration of 5000 mg/kg s.u. to 2228 mg/kg s.u., thus obtaining a 55% remediation percentage, after a period of 14 days. Consequently, it can be appreciated that the electrochemical process applied in order to remediate a soil contaminated with petroleum products is advantageous in terms of the short duration of time, but the method also presents some disadvantages such as energy consumption and implicitly significant related costs.

Keywords: Total Petroleum Hydrocarbons, TPHs, contaminated soil, remediation, electro-kinetic remediation.

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1. Introduction

Petroleum hydrocarbons are common site contaminants that affect human health and alter both microbial community and ecosystem functionality when these are introduced into a clean environment [1]. At the same time, these types of hydrocarbons can come into contact with the soil, forming an impermeable coating on the surface that prevents the circulation of water in the soil and the exchange of gases between the air and the soil [2].

Industrialization and practices have left us a legacy of thousands of contaminated sites in Europe. Therefore, at the EU level, there are currently approximately 3.5 million potentially contaminated sites. Soils represent a non-renewable but essential source for achieving the key objectives of the European Green Pact. Thus, the EU soil strategy for 2030 aims to protect and restore soil health for the benefit of people, nature, and climate change by establishing a series of objectives and strategies [3].
