

河北省石家庄市南部污灌区厚层包气带污染物自然衰减的微生物作用潜力评价

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中文摘要:本次研究的目的是利用传统的培养技术和现代的磷脂脂肪酸PLFA(Phosphor Lipid Fatty Acid)技术、Biolog技术、16 S rRNA基因变性梯度凝胶电泳DGGE(Denaturing Gradient Gel Electrophoresis)及测序技术,调查石家庄市南部污灌区厚层30 m包气带微生物含量、分布、活性和多样性,评价污灌区厚层包气带污染物自然衰减的微生物作用潜力。包气带沉积物样品通过岩芯钻探获得,用于物理、化学和微生物分析。结果显示,土壤层(5~20 cm)微生物含量高,活性高,代谢类型多,可培养的异养菌与自养菌、好氧异养菌、兼性厌氧异养菌和专性厌氧异养菌共存;土壤层下伏包气带微生物含量较低,活性降低,代谢类型减少,可培养的细菌主要是好氧性异养菌、兼性厌氧异养菌和好氧自养菌,而且随岩性而变化,在砂层和重粘土层含量低,活性低,而在亚粘土层含量和活性大。研究结果指示土壤层具有很高的污染物生物自然衰减潜力,而且下伏包气带仍有这种潜力,特别是下部溶解有机碳(DOC(Dissolved Organic Carbon))含量高的层位潜力更大。

中文关键词:[微生物作用潜力](#) [自然衰减](#) [厚层包气带](#) [污灌区](#)

Assessment of Microbial Process Potential for Natural Attenuation of Contaminants in the Thick Vadose Zone beneath the Wastewater-irrigated Area of Southern Shijiazhuang City, Hebei Province

Abstract:The purpose of this study is to investigate the abundance, distribution, activity and diversity of microbes in nearly 30 m thick vadose zone beneath the wastewater-irrigated area of southern Shijiazhuang to assess microbial process potential for natural attenuation of contaminants of the thick vadose zone using traditional cultivation technique and modern phosphor lipid fatty acid (PLFA), Biolog and 16 S rRNA gene denaturing gradient gel electrophoresis (DGGE) techniques. Sediment samples were collected by core drilling for analysis of physical, chemical and microbial properties. The results show that the top soil layer (5~20 cm) is characterized by high content of bacteria, high activity, plenty of metabolizable types and coexistence of culturable heterotrophic bacteria and autotrophic bacteria, aerobic heterotrophic bacteria, facultative anaerobic heterotrophic bacteria and obligate anaerobic heterotrophic bacteria. The lower vadose zone below the top soil layer is characterized by lower microbial content, lower activity, fewer metabolizable types relative to the top soil layer and harbors mainly culturable aerobic heterotrophic bacteria, facultative anaerobic heterotrophic bacteria and aerobic autotrophic bacteria. Moreover, these bacteria change with lithology, show low content and activity in the sand layer and the heavy clay layer, and increase in content and activity in the clayed silty layer. The results obtained by the authors show that the top soil layer has high potential for biological natural attenuation, and the lower vadose zone still has such potential, and especially has higher potential in the lower layer with high DOC (Dissolved Organic Carbon) content.

keywords:[microbial process potential](#) [natural attenuation](#) [thick vadose zone](#) [wastewater-irrigated area](#)

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