

旱作褐土中铁氧化物的厌氧还原动力学特征

Dynamics of anaerobic reduction of iron oxides in upland cinnamon soils

中文关键词: [旱作褐土](#) [铁氧化物](#) [厌氧还原](#) [氮硫循环](#)

Key words: [Semi-luvisol cinnamon soils](#) [Iron oxides](#) [Anaerobic reduction](#) [Cycling of N and S](#)

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中文摘要:

异化铁还原是厌氧环境中有机物降解的重要微生物过程, 不仅影响Cr、U等无机污染物在环境中的迁移, 还与CH₄、N₂O、H₂S等温室气体的释放关系密切。本文选择7个旱作褐土样品, 采用泥浆厌氧恒温培养的方法, 研究了旱作褐土中氧化铁的厌氧还原特征, 结果表明旱作褐土在淹水条件下可以发生铁氧化物的异化还原, 其还原潜势介于4.47~5.95 mg g⁻¹之间, 还原速率常数介于0.15~0.27 d⁻¹之间。褐土中部分晶态铁氧化物可在这一过程中被还原, 游离铁的平均还原率为41.95%。经过40 d厌氧培养后, 99.26%的NO₃⁻和88.82%的SO₄²⁻被还原。还原过程的速率常数k、V_{max}、T_{max}随着土壤有机碳含量增加而增加, 还原潜势与土壤SO₄²⁻含量呈显著负相关关系。

英文摘要:

Dissimilatory iron reduction is an important microbial process of the degradation of organic matter in anaerobic environment. It not only affects translocation of some inorganic pollutants, like Cr and U, but also is closely related to emission of greenhouse gases, such as CH₄, N₂O, H₂S, etc. Samples of cinnamon soils, collected from upland farmlands at 7 different locations, were prepared into slurry and then put under anaerobic incubation, to study characteristics of the anaerobic reduction of iron oxide in these soils. Results show that dissimilatory reduction of iron oxide occurred in the cinnamon soils under submergence, with reducing potential ranging from 4.47 to 5.95 mg g⁻¹ and a reduction rate constant between 0.15 and 0.27 d⁻¹. In the soils, a portion of crystalline iron oxide was reduced during the process and the mean reduction rate of free iron reached 41.95%. After 40 days of incubation, 99.26% of the NO₃⁻ and 88.82% of the SO₄²⁻ in the soils were reduced. And the rate constant, V_{max} and T_{max} of the iron reduction was positively related to soil organic carbon content, and the reducing potential negatively related to soil SO₄²⁻ content.

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