



碳酸盐岩风化壳岩-土界面风化作用机制——淋溶模拟实验的初步研究

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中文摘要: 碳酸盐岩风化壳通常呈现清晰突变的岩-土界面, 成为直接利用野外地质剖面的发育特征探索碳酸盐岩风化作用过程的障碍。本文选择贵州中部及湘西的4条典型碳酸盐岩原位风化壳的岩-土界面作为研究对象, 模拟排水条件良好的热季风化条件, 在24~29.5℃的环境温度下, 利用饱和CO₂水对各剖面岩粉层样柱开展了系统的淋溶实验研究(淋溶终点以碳酸盐完全溶蚀为标志)。通过对淋出液中主要造岩元素和淋溶残余物的动态取样分析, 初步揭示了碳酸盐岩风化壳岩-土界面的风化作用机制。结果表明: ①碳酸盐岩风化过程中, 碳酸盐的溶蚀和酸不溶物的分解是同步进行的, 在碳酸盐淋溶伊始, 酸不溶物已表现出明显的风化倾向; ②在排水条件良好的风化环境下, 由硅酸盐等酸不溶物组分分解溶出的盐基离子及Si等元素更易随风化溶液淋失, 使得在风化残余物中难以形成蒙脱石、伊利石、高岭石等自生粘土矿物; ③碳酸盐岩粉层的水-岩作用过程中, 当碳酸盐含量对水-岩反应而言过量时, 碳酸盐的溶蚀强度主要受岩粉层质地的制约。粒度粗, 渗透性强, 水-岩作用时间短, 碳酸盐的溶蚀量低, 反之亦然。而酸不溶物组分对于水-岩反应而言, 在整个淋溶周期内都是不足的, 其含量成为制约水-岩反应强度的主要因素; ④在表生气下环境, Ti、Al、Fe均为惰性元素, Mn和P表现出明显的活性。

中文关键词: [碳酸盐岩风化壳](#) [岩-土界面](#) [淋溶模拟](#) [风化作用机制](#) [酸不溶物](#) [贵州](#)

Weathering Mechanism of Rock-Soil Interface in Weathering Profiles Derived from Carbonate rocks——Preliminary study on Leaching Simulation Experiment

Abstract: The rock-soil interface of weathering profiles derived from carbonate rocks is generally sharp in the field, and this is an obstacle for exploring weathering mechanism of carbonate rocks by directly studying the development characteristics of field geological cross-sections. This paper selected the rock-soil interface of four typical in-situ weathering profiles of carbonate rocks as the subject investigated in central Guizhou Province and western Hunan Province, China. By simulating field well-drained weathering condition in hot season, water saturated with CO₂ was percolated through sample columns filled with rock powder at rock-soil interface of studied profiles, the temperature was among 24~29.5℃ throughout the leaching cycle, and the leaching end was marked by complete dissolution of carbonate. Through dynamic analyses on major rock-forming elements of leachate and leaching residue, weathering mechanism of rock-soil interface of weathering profiles of carbonate rocks was preliminary revealed. The research result is as follows: ① During weathering of carbonate rocks, dissolution of carbonate is synchronous with decomposition of acid-insoluble material, and acid-insoluble fraction has shown a clear weathering tendency at the begin of carbonate dissolution. ② In well-drained weathering environment, base cations and Si stemming from decomposition of acid-insoluble residue including silicate are more inclined to the migration along with leaching solution, which makes it difficult for authigenic clay minerals such as smectite, illite, kaolinite, etc., to form during weathering. ③ During water-rock interaction on rock powder layer of weathering profiles of carbonate rocks, when carbonate volume for water-rock interaction is excessive, dissolution intensity of carbonate is mainly constrained by the texture of rock powder layer. the grain size is the more coarse, the penetrability is the higher, the water-rock interaction time is the shorter, carbonate dissolution volume is the lower, and vice versa. However, acid-insoluble fraction for water-rock interaction is inadequate throughout the leaching cycle, and its volume is main factor restricting water-rock interaction intensity. ④ In subaerial environment, Ti, Al, and Fe are inert elements, Mn and P show significant activity.

keywords: [weathering profile of carbonate rock](#) [rock-soil interface](#) [leaching simulation](#) [weathering mechanism](#) [acid-insoluble residue](#) [Guizhou Province](#)

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