# Enhancement of biogenic methane production by co-degradation of coal and straw: microbial and organic analysis

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## Abstract

Co-degradation of coal and straw could produce significantly higher methane which was potential to increase biogenic CBM. In this study, the success of microflora and organic compounds during co-degradation was determined by MiSeq and GC-MS, and compared with cultivations with only coal (C) and with only straw (RS). The results showed that the methane production in co-degradation was 12 times higher than that in cultivation C. A shift of dominant methanogen was caused by the addition of straw from acetoclastic Methanosaeta in inoculum to methylotrophic Methanomethylovorans in 7 days, then hydrogenotrophic Methanobacterium. The bacteria and fungi with ability to degrade macromolecules in coal and metabolize VFAs were enriched which would facilitate methanogenesis. VFAs, especially butanoic acid, were dominant in intermediates of co-degradation which contributed to methane production as their content were negatively corelated with methane production. The different component of intermediates and microbial communities among co-degradation, cultivations C and RS suggested that the metabolic pathway in co-degradation was distinctive and the fracture of coal molecules was almost completed in the first 7 days of cultivation. Coal might also serve as the suitable microhabitat for microorganisms to avoid the threat from environment in addition to function as methanogenic substrates.

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