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Review

Biological monitoring for carbon capture and storage – A review and potential future developments

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ABSTRACT

Effective monitoring of carbon capture and storage (CCS) projects is essential, but detection of leaks and subsequent subtle changes in the surrounding environment are difficult to assess. New tools are being developed for this purpose, yet biological monitoring methods have been under valued; this is surprising given the rapid technological expansion in the field of microbial ecology over the last decade. A review of biological monitoring for CCS shows a number of techniques such as plant surveys, bacterial counts and DNA fingerprinting that have been applied to natural analogues or shallow injection sites. The results of the monitoring potential of these methods vary, perhaps explaining the limited research and adoption of biological monitoring for CCS projects. However, new tools such as microarrays provide rapid throughput that can characterise microbial populations and functional genes that may change due to CO_2 leakage and subsequent effects. These tools are not the whole answer for CCS monitoring, but they open new opportunities in this area and should lead to the development of simple biosensors and an expansion of the monitoring toolkit. Comparisons to other fields of research, such as tracing contaminants plumes of BTEX, demonstrate how the techniques reviewed can be developed and applied to CCS monitoring.

Contents

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