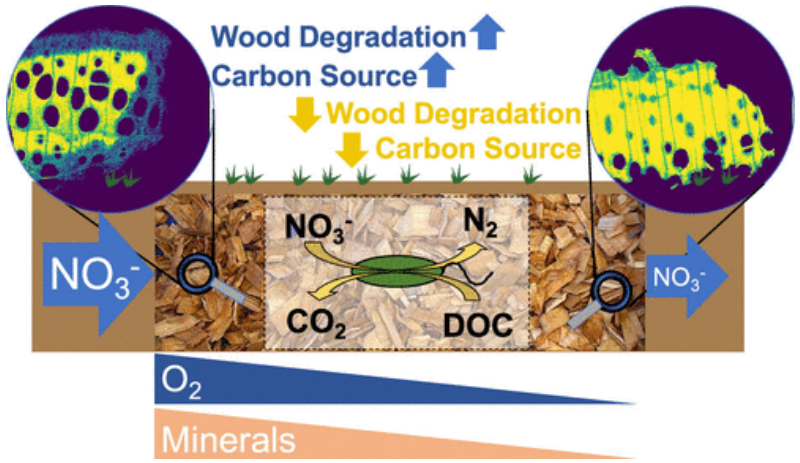
Improving Nitrate Removal by Woodchip Bioreactors



Scanning X-ray scattering tomography quantified the degradation (blue) of woodchips in the bioreactor. Simultaneously collected fluorescence data confirmed accumulation of metal ions near the surface of degraded woodchips. µXANES from thin sections then revealed redox gradients in Fe and Mn at the surface that likely enhanced wood degradation, which is associated with faster nitrate removal.

Scientific Achievement

Scientists showed that iron (Fe) and manganese (Mn) can serve as reactive oxidants to enhance wood decomposition in bioreactors.

Significance and Impact

Woodchip bioreactors provide a carbon source for microbes to remove nitrate from agricultural drainage. Understanding how metal ions enhance this process can improve their performance.

Research Details

- X-ray scattering tomography at the LiX beamline showed that woodchips from a bioreactor decomposed greatest near the surface.
- At the XFM beamline, µXANES analysis of Fe and Mn at the surface revealed a microenvironment of reactive oxidants that increased wood degradation, enhancing denitrification.

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