



## **Light in the soil: fiber optic chemical sensing and its application in soil science**

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Fiber optic sensing offers a number of advantages over other sensing technologies, including low reactivity, high tensile strength, and the sensor can operate several kilometres down-lead from the sensor interrogation system. This means it can be deployed over large networks in challenging environments. Fiber optics has been a part of soil sensing for a number of decades since the first demonstration of distributed temperature sensing. Recent developments in fiber optic applications include their use as deployable in-situ chemical sensing platforms. A Long Period Grating (LPG) is an optical fiber sensing platform that facilitates the specific detection of chemical changes in the surrounding environment. To harness LPGs for specific applications they must be coated with materials that respond selectively to a compound of interest. Here we present work on a range of soil relevant fiber optic chemical sensors as well as examples of fiber optic chemical sensors that have been deployed in field trials. These include sensors that have already been deployed in soil environments (soil moisture, temperature, pH and structure) as well as sensors that have been deployed in related fields but have significant relevance for applications in soil science (VOCs, salinity, redox, nitrates, and oxygenation).