In Situ Soil Nitrate Sensor

Tech ID: 30432 / UC Case 2007-770-0

ABSTRACT

The invention is used for determining in-situ nitrate concentrations in soil solution using either ISE (Ion Selective Electrode) or fiber optic spectroscopy when the liquid in the porous cup of the in-situ probe is equilibrated with surrounding soil solution through the diffusion process.

FULL DESCRIPTION

Lack of in-situ instrumentation makes it difficult to monitor concentration levels of various ions on site for specific management of environmental and agricultural practices. A new fast response and low sample volume in-situ stainless-steel soil solution sampler combined with ion selective electrode (ISE) or fiber-optic probes has been developed to determine in-situ ion concentrations in soil solutions without the need to extract soil solution to be analyzed in the laboratory. The invention specifically is used for determining in-situ nitrate concentrations in soil solution using either ISE (Ion Selective Electrode) or fiber optic spectroscopy when the liquid in the porous cup of the in-situ probe is equilibrated with surrounding soil solution through the diffusion process. Both instruments can be used interchangeably depending upon measurement objectives.

For the fiber optic probe, an ultraviolet (UV) light source was used to provide light for the measurements and a two-channel UV-VIS spectrometer was used for spectrum analysis. The spectrometer was coupled to a computer for data acquisition and analysis. With the fiber optic probe, changes in nitrate concentration can be monitored on a continuous measurement base whereas ISE can be used with desired time interval measurement schemes where continuous monitoring is not required. Using a one-point reference calibration, the ISE electrode can rapidly determine the nitrate concentration in soil solution at designated measurement intervals. In-situ solution samplers were designed to measure nitrate concentrations in soil solution but their versatile characteristics potentially allows for determination of different ranges of ions exist in the soil solution surrounding the sampler.

APPLICATIONS

- Monitoring nitrate levels in the vadose zone due to environmental and agricultural activities

FEATURES/BENEFITS

- Allows real time monitoring of nitrate concentrations
- In-situ without bringing samples to the laboratory
- Can be adapted for measuring other organic and inorganic ions in the soil solution

PATENT STATUS

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<td>United States Of America</td>
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OTHER INFORMATION

KEYWORDS

In situ, Nitrate levels, Soil monitoring, Soil Solution

CATEGORIZED AS

- Agriculture & Animal Science
- Devices
- Environment
- Sensing
- Sensors & Instrumentation
- Environmental Sensors
- Other

RELATED CASES

2007-770-0