

Innovative Forest Fire Early Warning System: Hydrogen-based fire detection

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Background and main objectives

During a typically dry Spring in Brandenburg a forest fire starts. Valuable timber is lost, people and animals are threatened. In 2003, a dry year, forest fires in Brandenburg resulted in damage totalling more than EUR 1 million.

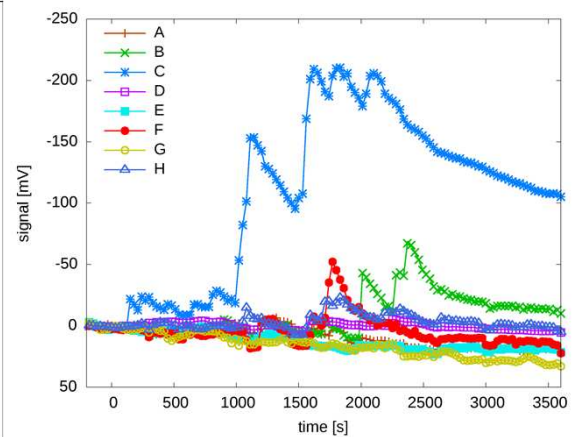
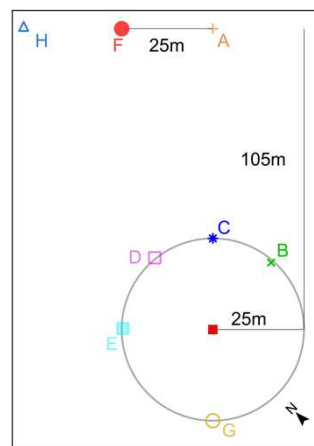
The existing Fire Watch System can only identify fires when intensive smoke is being developed, monitoring can be considerably impeded by landscape contours and other factors.

Therefore tests are being carried out on a hydrogen sensor developed at the Humboldt University Berlin which can be used to detect forest fires in the early stages, before open flames are formed.



Smouldering fire in a pine forest.

Results – Sensor testing in the field

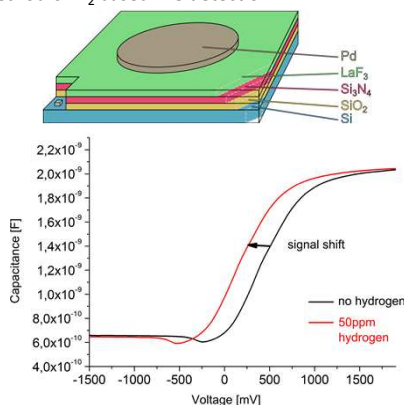


Seat of fire (■) and disposition of the sensors in the forest (left chart). Reaction of the sensors to the smouldering fire (right chart).

- Functionality of the principle was demonstrated.
- Detection was achieved for distances up to 105 m from the sensor (approx. 70 mV).
- Depending on the distance and the amount of gas released, a signal could be detected after 1-12 minutes.

Method

Method of H₂ based fire detection



Structure of the detection sensor (top chart). Sensor responses to different hydrogen capacity (lower chart).

Principle

- The pyrolysis (thermal transformation) of organic material releases hydrogen (H₂).
- H₂ molecules are small enough to penetrate the lattice structure of the detector and cause of change in capacitance.
- H₂ is a selective pyrolytic product, and suitable as an early indicator of forest fires.

Outlook



Sensor on a pine tree.

In view of changing climate conditions, the warning system is an important early warning and monitoring module for the protection of forests.