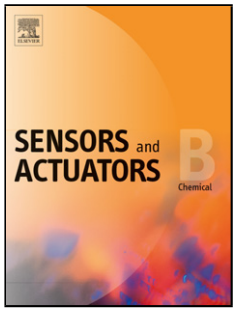


Title: Microstructured optical fiber based chloride ion sensing method for concrete health monitoring

Authors: Liyun Ding, Zhijie Li, Qingjun Ding, Xiang Shen, Yinquan Yuan, Jun Huang

PII: S0925-4005(18)30091-1
DOI: https://doi.org/10.1016/j.snb.2018.01.091
Reference: SNB 23940

To appear in: *Sensors and Actuators B*

Received date: 15-9-2017
Revised date: 20-12-2017
Accepted date: 6-1-2018

Please cite this article as: Liyun Ding, Zhijie Li, Qingjun Ding, Xiang Shen, Yinquan Yuan, Jun Huang, Microstructured optical fiber based chloride ion sensing method for concrete health monitoring, Sensors and Actuators B: Chemical https://doi.org/10.1016/j.snb.2018.01.091

# Microstructured optical fiber based chloride ion sensing method for concrete health monitoring

Liyun Ding[*1], Zhijie Li[1], Qingjun Ding[2], Xiang Shen[3], YinquanYuan[1], Jun Huang[1]

[1]National Engineering Laboratory for Fiber Optic Sensing Technology, Wuhan University of Technology, Wuhan, 430070, China

[2] School of materials science and engineering,Wuhan University of Technology, Wuhan, 430070, China

[3]Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan 430074, China

*Email:dlyw@whut.edu.cn

## Highlights

- The new optical fiber sensor based on suspended core fiber was designed to detect chloride, a linear calibration was obtained.
- The lucigenin/sol-gel membrane with a porous structure was prepared.
- The evanescent field turns out to be strong enough to the optical fiber sensing after simulating by COMSOL.
- Sensor still works even in high alkaline, alkaline environment could promote lucigenin's quenching but sulfate ions have opposite effect.

**Abstract:**Chloride erosion is the main factor to decrease durability of concrete, it is fairly important to control and monitor chloride in concrete structure. A new sensor based on a suspended core optical fiber was developed to detect the chloride in concrete, in which lucigenin is selected as a fluorescence sensitive material for chloride. A novel type of the sol-gel membrane was introduced to immobilize lucigenin onto the inner wall of the suspended core optical fiber with dip-coating method. The properties of the sol-gel membrane were characterized by scanning electron microscope (SEM) and Fourier transforming infrared (FT-IR), andenergyof evanescent field the suspended core optical fiber was calculated by using COMSOL. The fluorescence fluctuations of the optic fiber sensor are chloride concentration-dependent andthe relationship between relative fluorescence intensity and chloride concentration followsthe Stern–Volmerequation.The linear calibration formulas