

Fiber Optic Chemical Sensor for Air Pollutant Measurement

Design, Development and Applications

Ang Soo Seng, M. S. John and Anand Asundi

School of Mechanical and Production Engineering

Nanyang Technological University, Singapore 639798

Email: masundi@ntu.edu.sg

ABSTRACT

In this paper, the development of a sol gel encapsulated fiber optic chemical sensor to detect the presence and concentration of sulphur dioxide (SO₂) and nitrogen dioxide (NO₂), two major air pollutants are discussed. The sensing chemical, rhodamine 6G a fluorescence dye which absorbs light at 530nm and emits radiation at 560nm, is used to detect SO₂ while a combination of sulfanilamide (SFA) and N, N Dimethyl-1-naphthalamine (DMNA), which absorb light at 450nm, is used to detect NO₂. The sensing chemical used is exclusive to individual gases and responds to the specific gas. The chemical reaction between the gas and the sensing chemical changes the transmitted light intensity, which is detected by a spectrometer. The presence and concentration of the gas is determined by the change in light intensity and the rate of change in light intensity, respectively. Two probes are developed – an intrinsic fiber optic chemical sensor made up of a sol gel encapsulated chemical coated optical fiber and an extrinsic fiber sensor which uses a sol gel encapsulated chemical coated glass plate as the sensing element. Experiments show that the intrinsic sensor is better in fluorescence quenching test while the extrinsic performs better in light absorption experiments.