

Metal Oxide Coated Optical Fiber for Humidity Sensing Application: A Review

ABSTRACT

Humidity measurement in biomedical, industry and electronic manufacturing applications needs an accurate and fast measurement of relative humidity by the sensor. In recent years, electronic sensors are utilized in the market, but optical humidity sensors provide several advantages over it. This paper reports the classification of optical fiber humidity sensors based on their working principles, such as fiber Bragg gratings, interferometers, and resonators. Along with the mentioned optical fiber structures, their fabrication process, equipment required for humidity sensing and the coating technique used are explained in this review. Recently, metal oxide semiconductors have been widely used as sensing material, specifically in humidity sensor applications. Thus, this paper explores optical fiber humidity sensors based on the three working principles mentioned, all of which incorporate metal oxide coatings. This review reveals that the most commonly used metal oxide for optical fiber humidity sensing is graphene oxide. This is because graphene oxide offers high sensitivity, fast response and recovery time over the other types of metal oxide. A large number of oxygen-containing groups on the surface and edge of graphene oxide also contribute to humidity sensing performance since it can permeate and absorb more water molecules. The use of hybrid nanomaterials is recently discovered and their potential as emerging coating material for optical applications are not fully exploited yet. Thus, there is still an opportunity for improvement in terms of sensitivity, response and recovery time in the context of optical fiber humidity sensor.