

Optical Fiber Sensing Technologies based on Sensitive Thin Films and Coatings

The combination of fiber optics with nano-structure technologies and sensitive thin films offers great potential for the realization of novel sensor concepts. Miniatured optical fiber sensors with thin films as sensitive elements could open new fields for optical fiber sensor applications. Thin films work as sensitive elements and transducer to get response and feedback from environments, optical fiber here are employed to signal carrier. Concrete examples are: Pd/WO₃ co-sputtered coating as sensing material for optical hydrogen sensors shows robust mechanical stability and meanwhile good hydrogen sensing performance. Miniatured optical fiber sensors based on Fabry-Perot thin film structure are also proposed, the transducer deposited on fiber end-face is multilayer coating consisting of a stack of porous dielectric oxide materials. The reversible adsorption and desorption of water molecules in the porous films in dependence on water vapor shifts the reflected interference spectrum fringe, therefore humidity sensing is correlated with the shift of interference fringe. Micro-structured Farby-Perot (F-P) sensors on single mode fiber (SMF) could be realized with femtosecond (fs) laser, and could be integrated with sensitive thin films for new sensing applications.