

# Oral Presentations

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## Development of Innovative Low Cost POF Sensors for Monitoring Chemical and Environmental Quantities

**Ishtaiwi M.**<sup>1</sup>, Parvis M.<sup>2</sup>, Grassini S.<sup>3</sup>

<sup>1</sup>*Department of Physics, An-Najah National University, Nablus, Palestine*

<sup>2</sup>*Department of Electronics and Telecommunications, Politecnico di Torino, Torino, Italy*

<sup>3</sup>*Department of Applied Science and Technology, Politecnico di Torino, Torino, Italy*

[m.ishtaiwi@najah.edu](mailto:m.ishtaiwi@najah.edu)

### Abstract

This work aims at the design and development of innovative sensing systems based on optical technology. Plastic Optical Fiber (POF) can be successfully employed for the development of highly sensitive and selective devices to be used in monitoring environmental and chemical quantity. This paper describes an approach to develop low-cost plastic optical fiber sensors suitable for measuring low concentrations of pollutants in the atmosphere, such as low concentrations of hydrogen fluoride (HF) vapors. The sensor is based on plastic optical fibers whose surface is modified in such way to make it sensitive to the presence of specific contaminants (below to 0.1 ppm of HF). The approach proposed for the realization of the sensors foresees the surface modification of the plastic optic fiber in three steps: (i) removing of the cladding by an organic solvent (such as ethyl acetate); (ii) performing a plasma nanotexturing of the core surface using oxygen/argon plasma treatments (iii) deposition of the sensitive thin film (SiO<sub>2</sub>) able to react with HF by using PECVD (Plasma Enhanced Chemical Vapor Deposition) and/or plasma sputtering. The pollutants (fluoride ions) attack the SiO<sub>2</sub> film and alter the transmission capability of the fiber so that the detection simply requires a LED and a photodiode. The sensor exploits a cumulative response which makes it suitable for direct estimation of the total exposure to the fluoride ions.