

# **OPTICAL FIBER HUMIDITY SENSOR BASED ON LOSSY MODE RESONANCES**

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**Abstract-** A novel optical fiber humidity sensor based on lossy mode resonances (LMR) has been developed. LMRs are supported here by a thin Indium Tin Oxide (ITO) coating fabricated onto an optical fiber core via a sol-gel dip coating. ITO coated optical fiber devices present a resonant maximum absorption peak in the infra-red region which is shifted to higher wavelengths when the refractive index of the medium in contact with the ITO layer is increased. A polymeric structure is deposited onto this ITO using the Layer-by-Layer (LbL) technique. The refractive index of this polymeric coating is sensitive to changes in the external relative humidity (RH), which permits the fabrication of humidity sensors based on LMRs. The wavelength based fabricated sensors showed a dynamical range of 65 nm when the RH varied in the range from 20 to 80% and it has a good linearity when the RH is higher than 40%, high stability and are highly reproducible.

**Index terms:** Optical fiber sensors, lossy mode resonance, humidity sensor, spectroscopic techniques, Layer by Layer, ITO.