Influence of the Cladding Structure in PMMA mPOFs Mechanical Properties for Strain Sensors Applications - DTU Orbit (07/12/2018)

This paper presents a dynamic mechanical analysis (DMA) of a microstructured polymer optical fiber (mPOF). The fiber material is polymethyl methacrylate (PMMA), which is widely available commercially. The DMA is made by means of sequential strain cycles produced with an oscillatory load with controlled frequency to obtain the variation of the Young’s Modulus with respect to temperature, frequency and humidity for mPOFs with 2, 3 and 5-ring hexagonal microstructured cladding. Results show that the 3 different cladding structures have similar Young’s modulus on the stress-strain tests performed. Furthermore, the 3-ring structure presents the lowest Young’s Modulus variation with temperature among the samples tested, whereas the 5-ring structure presents a Young’s Modulus variation with frequency 25% lower than the 2 and 3-rings cladding structures. Regarding the humidity sensitivity, the 2-ring structure presented a 30% lower Young’s Modulus variation for a 25% humidity increase. The results obtained provide guidelines for the cladding structure choice for strain or stress sensors applications when low cross-sensitivity with temperature, humidity and frequency is desired.

General information
State: Published
Organisations: The Hempel Foundation Coatings Science and Technology Centre (CoaST), Department of Mechanical Engineering, Department of Photonics Engineering, Fiber Sensors and Supercontinuum Generation, Universidade Federal Do Espirito Santo, Polytechnic University of Valencia, University of Aveiro
Pages: 5805-5811
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: IEEE Sensors Journal
Volume: 18
Issue number: 14
ISSN (Print): 1530-437X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.29 SJR 0.619 SNIP 1.555
Web of Science (2017): Impact factor 2.617
Web of Science (2017):Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.12 SJR 0.654 SNIP 1.683
Web of Science (2016): Impact factor 2.512
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.85 SJR 0.655 SNIP 1.84
Web of Science (2015): Impact factor 1.889
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.5 SJR 0.775 SNIP 1.894
Web of Science (2014): Impact factor 1.762
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.6 SJR 0.663 SNIP 1.786
Web of Science (2013): Impact factor 1.852
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.09 SJR 0.663 SNIP 1.616
Web of Science (2012): Impact factor 1.475
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.13 SJR 0.693 SNIP 1.653
Web of Science (2011): Impact factor 1.52