Advanced Research in Electrical and Electronic Engineering
Print ISSN: 2349-5804; Online ISSN: 2349-5812 Volume 2, Number 4 January-March (2015) pp. 372-372

http://www.krishisanskriti.org/areee.html

Development of Functional Photonic Crystals for Energy Applications

Koduri Ramam[1*], Alexandra Elena Sepulveda Rebolledo[1], Maximiliano Jara Fornerod[2], B.S. Diwakar[1], V. Swaminadham[3], K. Chandra Mouli[4] and Y. Aditya[5]

[1]Nanocomposite Laboratory, Departamento de Ingeniería de Materiales-DIMAT, Facultad de Ingeniería, Universidad de Concepción, Concepción, Chile
[2]Dept. of Materials Science and Engineering, School of Engineering, Ecole Polytechnique Fédérale de Lausanne-EPFL, Lausanne, Switzerland
[3]Department of Basic Sciences and Humanities, Swarnandhra College of Engineering & Technology, Seetharampuram, Narsapur, Andhra Pradesh, India
[4]Department of Engineering Physics, College of Engineering, Andhra University, Visakhapatnam, Andhra Pradesh, India
[5]College of Engineering, Andhra University, Visakhapatnam, Andhra Pradesh, India
*E-mail: *ramamk@udec.cl*

Abstract—*This investigation highlights the advanced hybrid photonic crystal structures for energy harvesting to electric power the portable electronics / gadgets, powering remote areas / zones. Ferroelectric Photonic Crystals (FPCs) of PLZT were synthesized by the sol–gel process, and calcined at 750°C. Magnetic Photonic Crystals (MPCs) of Fe_3O_4 embedded SiO_2 spheres were synthesized by a sol-gel method. As received and heat treated PCs were characterized for phase analysis by powder XRD, nanostructure by TEM, magnetic studies by VSM, dielectric and piezoelectric properties. XRD analysis of FPCs indicated that cubic perovskite phase had favoured in heat treated PCs and face cantered cubic magnetic PCs in MPCs, respectively. FPCs ranged between 255 and 425 nm and MPCs ranged between 247 and 708 nm. Frequency dependent dielectric studies indicated that FPCs were sensitive to wide range frequencies reaching MHz. Field induced strain piezoelectric studies attested the FPCs micro-displasive capabilities in the order of 0.8 μm. VSM studies confirmed the influence of non-magnetic SiO_2 on magnetic Fe_3O_4, which resulted in optimum magnetic properties with respect to Fe_3O_4 concentration in SiO_2-Fe_3O_4 spheroids. Thus, these FPCs and MPCs could be used for possible and potential energy conversion applications.*

Keywords: *Photonic crystals, piezoelectric, magnetic, PLZT, Fe_3O_4 embedded SiO_2, energy harvesting,*

ACKNOWLEDGEMENTS

The author Koduri Ramam acknowledges and is grateful to Fondecyt Regular research project 2014 number 1140420 funded by FONDECYT, CONICYT, Chile and Universidad de Concepcion, Concepcion, Chile.