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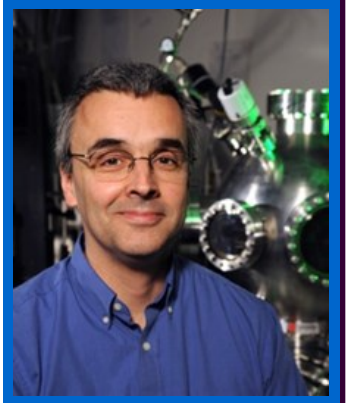
Dr. Alberto Piqué

Materials Science and Technology Division, Naval Research Laboratory, Washington DC, USA

Laser Processing of Metal Oxides for Plasmonic and Metamaterial Applications



Dr. Alberto Piqué

The use of metal oxides for plasmonic and metamaterials structures has been the subject of extensive discussions given their application in the IR and THz portion of the spectrum. Noble metals such as Au and Ag have been used traditionally for plasmonic devices in the visible but are not suitable for near infrared (IR) plasmonic applications due to their relatively large optical losses. Recently, metal oxides have been used as low loss materials in the near IR given their tunable carrier density through doping. However, new processing techniques are needed in order to incorporate these metal oxide materials into the required structures called by the plasmonic and metamaterial designs. This can be addressed through the use of laser-based processes for the fabrication of arbitrary periodic and aperiodic structures found in most metamaterial and plasmonic designs. For these applications, laser-based processes such as pulsed laser deposition or PLD and laser direct-write or LDW offer numerous advantages since they can be applied to virtually any surface over a wide range of scales. PLD allows the deposition of high quality conductive oxides whose lower plasma frequencies make them ideally suited for near IR plasmonic applications. Furthermore, LDW techniques allow the precise deposition and/or removal of material in non-lithographic fashion, thus enabling the fabrication of novel metamaterial designs over 2D and 3D surfaces. This presentation will show examples of metamaterial and plasmonic structures developed at the Naval Research Laboratory via laser processing of metal oxides and discuss their benefits for various applications.

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Dr. Alberto Piqué is Acting Head of the Materials and Sensors Branch in the Materials Science Division at the Naval Research Laboratory. Dr. Piqué and his group have pioneered the use of laser-based direct-write techniques for the rapid prototyping of electronic, sensor and micro-power generation devices. Dr. Piqué holds a B.S. and M.S. in Physics from Rutgers University and a Ph.D. in Materials Science and Engineering from the University of Maryland. To date, his research has resulted in over 200 scientific publications and 21 issued U.S. patents (plus 8 pending). He is a SPIE (2012) and APS (2014) Fellow, an Associate Editor of the Journal of Laser Micro/Nanoengineering and is a member of the Board of Editors of Applied Physics A: Materials Science & Processing.

Host:
Professor Yongfeng Lu

Department of Electrical & Computer Engineering

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Wednesday, March 30, 4:00 pm | 136 Jorgensen Hall
3:45 - Refreshments in Jorgensen Atrium