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## Biomimetic Parylene-coated artificial hair cells bio-MEMS as a platform for biosensing applications

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**H**air cells are natural and efficient mechanoreceptors ubiquitously present in nature and defined as “Cellular Antennae”. These systems are exploited as efficient transducers for flow sensing and chemical sensing in many living systems, ranging from cells to aquatic animals. Bio-mimicking hair cells structure and behavior for developing micro electro-mechanical systems (MEMS) artificial hair cells (AHC) could be a powerful approach for producing efficient sensors in liquid and humid environments for medical diagnosis purposes.

This presentation will review the most recent approaches and designs to realize waterproof hair cell-like mechanotransducers for applications in liquid environments. A particular emphasis will be given on Parylene C conformal coating as a successful method for waterproofing an AHC-based Bio-MEMS. Indeed, Parylene C is a polymer well known for its inertness and chemical resistance, thus ideal for covering and sealing 3D substrates and structures by conformal coating. Parylene-coated nitride-based piezoresistive and “All-Parylene” suspended microchannel AHCs has been fabricated and characterized for biosensing applications.

Finally, different strategies for the Parylene C functionalization, namely drop-casting and micro-contact printing, for obtaining of micrometric pH-responsive poly(methacrylic acid) (PMAA) hydrogel particles deposition will be shown. Through the exploitation of the previous described AHC sensor designs, Parylene chemical functionalization becomes very promising as a responsive platform for many applications involving Parylene C coated devices, such as mechanical biosensor and Lab-on-chip or biomedical devices.

### Biography

Francesco Rizzi is researcher and team leader in “MEMS and nanofabrication” platform at the Center of Biomolecular Nanotechnologies of Istituto Italiano di Tecnologia (IIT) in Lecce (Italy). He got a PhD in Physics in 2004. He did his post-doc at Department of Physics and Institute of Photonics, University of Strathclyde, Glasgow (UK), where he won an Experienced Researcher Marie Curie Fellowship. Research interests and activities are related on bio-inspired micro electro-mechanical systems (MEMS) for applications in biological and environmental sensing, artificial hair cells fabrication for flow sensing in robotics. He is also author of 28 manuscripts on international journals and proceedings of international conferences, 2 patents, 2 book chapters.

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