PHYSICS

MUR DM118Study of optical and transport properties of conductive polymers and 2D materials by means scanning probe techniques combined with Plasmonics

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]

Supervisor	DI FABRIZIO ENZO MARIO - enzo.difabrizio@polito.it

Contact	

Context of the research activity	Nano physics and spectroscopy on novel materials as 2D semiconductors and coductive polymers. The Physics involved regards the generation of Surface Plasmon Polaritons and the use of their two channels decay as a) scattered photons and b) hot electrons. The Photons will be used in the enhanced Raman spectroscopy and the hot electrons, will probe the electron transport of the material. The injection of hot electrons will be studied optimizing and modeling the Shottky barrier between the AFM tip and the material under investigation. Progetto finanziato nell'ambito del PNRR – DM 118/2023 - CUP E14D23001640006

Objectives	The research is based on the generation of plasmon polaritons by visible laser excitation on the tip, coated by noble metals, of an Atomic Force Microscope (AFM) that will act as a nanoprobe for probing the transport and optical properties of conductive polymers and 2D material as Graphene. The transport properties are measured through the injection of hot electrons in the material, the optical properties will investigated through the light scattering of photons generated at the tip apex. Both, hot electrons and photons, are generated buy the decay of plasmon polaritons generated at the tip end of the AFM cantilever. The study aims at measuring 2D current and optical maps of spatial resolution below 5 nm in order to extract and elucidate the structural properties of material at nanometer scale.

Skills and competencies for the development of the activity	The candidate should have known the basic courses on physics and electromagnetism and basic knowledge of optics. The advanced concepts will be acquired during PhD thesis.