**Physics** & **Astronomy**

Colloquium

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**Dr. Andreas Kaltzoglou**

National Hellenic Research Foundation

**3:30 - 4:30 p.m. | Tuesday, Nov. 14**

**Science Building 234**

**Exploratory synthesis of semiconducting materials and advanced physical characterization methods**

In this seminar, I will present the advances in the fields of semiconducting materials for photovoltaic, light-sensing and thermoelectric applications, emphasizing the preparation and characterization methods. It is well known that solar cells are one of the main renewable energy sources. In quest of materials more efficient than silicon, this research focuses on semiconductors such as GaAs, CuIn1-xGaxSe2 (0 ≤ x ≤ 1) as well as halide perovskites (CH3NH3PbI3). Despite the high power-conversion efficiencies of the 3rd generation solar cells, this technology has not yet reached commercialization, either due to the toxicity of the elements, e.g. As, or due to the instability of the compounds, e.g. hydrolysis of CH3NH3PbI3. Therefore, novel chemical compounds are sought in my research group with lower toxicity and higher stability, e.g. [(CH3)3S]2SnI6. With regard to thermoelectric materials, they usually exhibit semiconducting behavior, as in tellurides (Bi2Te3), clathrates (Cs8Sn44), skutterudites (Yb0.2Co4Sb12) and tetrahedrites (Cu10.4Ni1.6Sb4S13). So far, their applications are limited to thermocouples for temperature measurement (Seebeck effect) and specialized cooling systems, such as portable refrigerators and computer processors (Peltier effect). The energy recovery from wasted heat in the form of electricity is the main goal for thermoelectric use, for example on engine exhausts and on building surfaces. Innovative methods using reactive precursors, e.g. Cs4Sn9, in liquid or solid state are studied in my research group for the synthesis of novel inorganic and organic-inorganic

semiconductors. Moreover, the chemical composition – crystal structure – physical properties relations are analyzed, emphasizing on advanced characterization methods, such as THz spectroscopy.

**Refreshments at 3 p.m. | SC 103**

**Bio**

Andreas Kaltzoglou received his Bachelor’s and Master’s Degree in Chemistry at the Aristotle University of Thessaloniki, Greece. In 2009, he earned his Doctoral Degree on semiconducting clathrates at the Chemistry Department of the Technical University of Munich, Germany. In the period 2010 – 2014, he worked at the Heriot-Watt University, Edinburgh, and at the University of Reading, United Kingdom, as postdoctoral researcher and fixed-term lecturer on thermoelectric materials. In 2015, he moved to the National Centre for Scientific Research ‘Demokritos’, Greece where he worked on perovskite solar cells and luminescent materials. Since 2020, he has been appointed as researcher at the Institute of Theoretical and Physical Chemistry, National Hellenic Research Foundation, Greece. Overall, the activity of his research group focuses on the synthesis of new chemical inorganic or organic-inorganic compounds and the study of their physicochemical properties for the development of technological materials.