Project 3.1 Photophysics and Bimolecular Reactions of Metal Nanoclusters

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www: https://ichf.edu.pl/zespoly/dynamika-dwuczasteczkowych-reakcji-indukowanych-swiatlem

Background:

Atomically precise metal nanoclusters (APMNs) are in the border between molecules and nanoparticles with a unique set of properties and a great potential for many applications. Unraveling them would be extremely interesting from a basic point of view and for photovoltaics, catalysis, bioimaging or optoelectronics. There is a long-standing debate about the nature of the electronic states involved in their optical transitions and about their peculiar behavior: lack of similitude between the absorption and the luminescence excitation spectra, multiexponential luminescence decays, relatively low emission yields... Much has been advanced in the elucidation of the role of the organic capping or of other metal doping, although still the precise mechanisms await an explanation. There are two reasons for this: first it is difficult to isolate atomically precise species, and secondly structurally-related spectroscopies have not yet been fully applied to this problem.
In collaboration with a group in Geneva, able to design and characterize well defined stoichiometries of APMNs, in particular gold nanoclusters, our Warsaw group will apply state-of-the-art photophysical and electrochemical methods to study the nature of the states involved in the optical transitions, especially with femto-second stimulated Raman scattering. Thus, with this project we have the possibility to fully uncover the structure- and composition related contributions to the photophysical characteristics of the APMNs.

Aim:

To describe the photophysical and electrochemical properties of Atomically precise nanoclusters. To determine their reactivity in solution.

Requirements:

- able to properly communicate in English,
- Master in physics, chemistry or related,
- good experimental skills in the project's techniques: optical absorption and fluorescence, time resolved methods, Raman spectroscopy and electrochemistry,
- good knowledge of: Physical Chemistry, Chemical Kinetics, Photophysics and electrochemistry,
- able to program in Matlab or similar.