**Polskie Towarzystwo Chemiczne, Oddział Gliwicki**

dr hab. inż.
Jakub Adamek, prof. PŚ
Przewodniczący Zarządu Gliwickiego Oddziału Polskiego Towarzystwa Chemicznego

Szanowni Państwo,

w imieniu Zarządu Gliwickiego Oddziału Polskiego Towarzystwa Chemicznego mam przyjemność zaprosić Państwa na seminarium organizowane przez Zespół Chemii Fizycznej Materiałów Foto- i Elektroaktywnych:

**„New photoactive materials”**
14/11/2025, $11^{00}$ – $12^{00}$
ul. Strzody 9, 44-100 Gliwice
sala 103b (Czerwona Chemia)

1. Dr hab. Anna Lewandowska-Andrałojć, prof. UAM, Uniwersytet im. Adama Mickiewicza w Poznaniu

*„When Dyes Meets 2D Materials – Spectroscopic and Photocatalytic Properties”*

2. Dr Aleksandra Lindner, Helmholtz-Zentrum Dresden-Rossendorf

*„Organic chromophores on ferromagnets illuminated: a photochemical and magnetic study”*

Plakat informujący o wydarzeniu w załączeniu.
Krótka informacja o tematyce seminarium oraz prelegentkach poniżej.

**Bardzo serdecznie zapraszam.**

Z wyrazami szacunku
dr hab. inż. Jakub Adamek, prof. PŚ
Przewodniczący Gliwickiego Oddziału PTChem

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**Anna Lewandowska-Andrałojć** is an Associate Professor at the Faculty of Chemistry and the Center for Advanced Technologies, Adam Mickiewicz University in Poznań, Poland, where she leads the Nanomaterials & Light Research Group. She received her Ph.D. in Chemistry in 2011 and her habilitation in 2021 from Adam Mickiewicz University.

Anna Lewandowska-Andrałojć completed a long-term postdoctoral fellowship at Brookhaven National Laboratory (USA), where she conducted research on artificial photosynthesis. She has also undertaken several short international research stays, including two visits to the Radiation Laboratory at the University of Notre Dame, as well as research stays at the California Institute of Technology and the Instituto de Tecnología Química in Valencia, Spain.

She has been the principal investigator of several research projects funded by the National Science Centre including the SONATA 10 grant on nanohybrids for photocatalytic hydrogen evolution and the Preludium BIS project. In 2025, she was awarded the SONATA BIS grant for the project “Spin-Controlled Green Energy: Photo(electro)catalytic Water Splitting with Chiral Materials.”

Her scientific interests include the photochemistry and photophysics of porphyrins, photocatalysis, and the design of nanostructures based on two-dimensional materials for solar hydrogen generation and environmental applications. She is also engaged in studying reaction mechanisms using time-resolved spectroscopic techniques.

# When Dyes Meets 2D Materials – Spectroscopic and Photocatalytic Properties

Anna Lewandowska-Andralojc

*Adam Mickiewicz University, Faculty of Chemistry, Uniwersytetu Poznanskiego 8, Poznan, PL*
*AMU, Centre for Advanced Technologies, Uniwersytetu Poznanskiego 10, Poznan, PL*

By functionalizing dye molecules (porphyrins, xanthenes) to 2D materials with unique layered structures 2D-LM (GO, RGO, $Ti_3C_2T_x$, $Nb_2C$) we constructed novel nanomaterials that were tested in photocatalytic hydrogen production, rhodamine B photodegradation and singlet oxygen generation [1-6]. Using steady-state and time-resolved absorption and emission spectroscopy, we examined in detail the interactions between excited-state dyes and 2D-LMs. The application of time-resolved spectroscopic techniques enables a deeper understanding of the excited-state dynamics, providing valuable insights into the potential of these hybrid materials for various photoinduced processes and applications. By integrating two types of functional materials: graphene oxide and Co-MOF we designed a stable system with enhanced charge-separation properties which ultimately boost their photocatalytic activity. The activity of our Co-BDC in the presence of graphene oxide was found to be (33,300 µmol $g^{-1}$ $h^{-1}$ per gram of MOF) [2].

Recently we explored the hydrogen production by functionalizing non-covalently eosin Y to $Ti_3C_2T_x$ or $Nb_2C$ [3-4]. We carried out photocatalytic hydrogen evolution experiment of the EY/$Ti_3C_2T_x$/$CoSO_4$ system under incident light wavelength. Hydrogen evolution rate of 40.9 mmol $h^{-1}$ $g^{-1}$ and AQE = 35.7% at 505 nm has been obtained which is higher than for the analogue system in which CoSO4 was replaced by the $H_2PtCl_4$ [3].

Our results demonstrate that dye functionalization with 2D layered materials provides a promising route for designing multifunctional materials that efficiently convert and utilize solar energy in various chemical and technological processes.

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**Biographical note**

**Aleksandra Lindner**

**Current position:** research scientist at the Magnetism Department in the Institute of Ion Beam Physics and Materials Research in Helmholtz-Zentrum Dresden-Rossendorf (HZDR)

**Education and academic career**

- Studied chemistry at the Adam Mickiewicz University in Poznan (M.Sc. 2002, organic synthesis),
- Accomplished joint doctoral studies at the University of Leipzig, Germany and Adam Mickiewicz University in Poznan (Ph.D. 2006, radical reactions studied by pulse radiolysis),
- Spent two years as postdocoral researcher at the Notre Dame Radiation Laboratory, University of Notre Dame, IN, USA in the group of Prof. Prashant Kamat,
- Worked at the Adam Mickiewicz University as a research associate managing as PI two projects: Marie Curie Reintegration Grant and SONATA1 financed by the NCN,
- Since 2017 research scientist at the HZDR. Currently PI of two bilateral projects financed by the German Research Fundation (DFG).

**Research interests**

Modification of thin film surfaces with metallic nanoparticles and organic chromophores for light sensitization; photophysical and dynamic magnetic properties of such hybrid materials.

# Ferromagnets illuminated: a photochemical and magnetic study

Aleksandra Lindner

*Helmholtz-Zentrum Dresden-Rossendorf*

Within recent years the so called spinterface—the interface between ferromagnetic and molecular materials—gained a lot of attention as an ideal platform for creating new spin-related effects [1]. Even though molecular spintronics, where the spinterface plays a central role, is a vividly developing field, surprisingly little has been done to explore the potential of inorganic/organic interfaces in combination with advantages offered by the light-induced processes in organic chromophores.[2]

Porphyrin chromophores were covalently anchored to thin gold-capped ferromagnetic films (FM/Au) through chiral oligopeptide chains, forming a self-assembled monolayer (SAM). Properties of such FM/Au/SAM inorganic/organic interfaces were studied in parallel using (i) photochemical methods (steady-state and transient absorption spectroscopy) to provide detailed characterization of the behavior of the photoexcited molecular layer in the vicinity of the FM, and (ii) ferromagnetic resonance spectroscopy (FMR), an exceptionally sensitive method for detecting changes in the dynamic magnetic properties of the FM, induced by the molecules in their ground and photoexcited states.

An attractive alternative to organic chromophores for light sensitization of thin ferromagnetic layers are plasmonic nanocrystals (NC) and their 2D assemblies with tailored spectral properties.[3] The mainstream of this research focuses, however, on light induced changes of static magnetic properties.[4] Controlling/triggering spin currents (or spin dynamics) with external stimulus such as light, although highly promising, has received limited attention so far.

Silver nanocrystals were assembled on the surface of thin ferromagnetic films and imaged using scanning electron microscopy. The optical response of such hybrid systems was probed via stead-state absorption spectroscopy and FMR was employed to examine their magnetization dynamics in dark and under illumination.

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