Much has already been done, but much work is still ahead of us - the main thought accompanies scientists every day, resulting from the ever-increasing demand for new technologies. This demand tries to stay one step ahead of the pace of development. To keep pace, we - scientists are obliged to look for new technological solutions that will be more efficient, cheaper and widely available for people. A remedy that can solve the emerging demand are materials dedicated to organic electronics. These include materials and technologies such as light-emitting diodes (OLEDs), solar cells (OPVs - organic photovoltaics, DSSC - dye-sensitized solar cells) and organic field-effect transistors (OFETs). For the average person, these are the materials involved in producing smartphones, LED TVs, computers or photovoltaic panels, which are more and more often installed on our roofs or in our gardens. The materials from which these technologies are made have certain specific photophysical properties, thanks to which they emit or absorb light in the expected range of colours with the expected efficiency.

Such an interesting group of compounds are derivatives of azapyrenes, i.e., chemical compounds which are isosteres of pyrene – molecule, which is usually obtained by isolating from soot during incomplete combustion of hard coal. An intense blue emission characterises pyrene derivatives, and they are suitable substrates for subsequent reactions, as a result of which other molecules with different expected properties can be obtained. Considering the mentioned properties, the subjects of this project are innovatively substituted in various configurations azapyrenes containing at non-K region (the 1, 3, 6, and 8-positions) and the nodal plane (the 2 and 7-positions) nitrogen atom(s), so far, they have been little known due to the high synthetic challenge. Thanks to the modern approach to chemical synthesis and the latest knowledge in this field, obtaining the expected derivatives of azapyrenes will be possible. It is also worth mentioning that the implementation of this project will also allow checking the possibility of carrying out the reaction in a different way than that commonly used by scientists. In this range, the reactions will be carried out in microwave heating, which will significantly shorten the reaction time, reduce the amount of solvents used, reduce the amount of waste generated, and, most importantly, increase the efficiency of the reaction. It is a procedure in mind with our natural environment so that chemistry has the most negligible negative impact on the surrounding nature, called "Green Chemistry". These compounds themselves will show interesting photophysical properties and can be used for synthesising other groups of chemical compounds, such as coordination compounds, where appropriately designed azapyrenes' derivatives will act as NNN-cyclometalating ligands.

Optical, electrochemical, and thermal properties will characterise all target compounds and intermediates comprehensively. Moreover, the additional essential aspect is to check the possibility of generating white-light emission, which remains a challenge due to the need to get fluorescence covering the visible region (400-700 nm) upon excitation of the dye at near-ultraviolet wavelength. Research planned in this way will give crucial information on how individual structure modifications affect the properties of target compounds. This knowledge, i.e., the understanding of the structure-properties relationship, will allow us to modify in the next stages, i.e., change individual elements or expand them, which creates a wide range of conscious influence on the properties of the synthesised structures, which will result in more effective molecules than those already known, used in organic electronics. All experimental research will be supported by theoretical calculations based on quantum-mechanical methods such as DFT (density functional theory) and TD-DFT (time-dependent density functional theory). By collaborating with material scientists, the most promising compounds will be tested. Only such a complementary approach to the presented research problem can fully solve the research problem and allow us to achieve the planned goals and improve our life.