Metals as conductor material have some disadvantages in processing e.g. casting, forging, sintering being energy-intensive, these are very heavy compared to plastics and natural materials and also corrode. All metals are opaque, which is a significant drawback with many applications. That's why metals are increasingly being replaced by organic conductor. Presently, many organic conducting compounds have now been obtained - first includes compounds with small aromatic molecules (e.g. pentacene) and the other with long π-conducting macromolecules - polymers. Since the discovery of first conducting polymer of doped polyacetylene, π-conjugated organic polymers boost many important applications in the development of flexible, low-cost optoelectronic, such as light-emitting diodes, transistors etc. At the same time, two-dimensional (2D) organic materials such as graphene and graphene-like compounds have also attracted tremendous interests due to their unique structural and electronic properties, for example, much increased planarity, much suppressed structural defects, and the associated much enhanced electron delocalization as well as much higher charge-carrier mobilities than those in traditional one-dimensional (1D) polymers. Currently, there is vigorous research activity toward the creation of novel two- (2D) or three (3D) dimensional by extending π-conjugation, covalent bonding of metal ion-ligand and/or use of long-range interactions (hydrogen bonding, π-stacking interactions) in a second or/and third dimension. We can mention, for example polymer such as metal–organic frameworks (2D MOF), covalent organic frameworks (2D COF), the covalent triazine frameworks (CTF) or structure with three-dimensional electronic delocalization e.g. chiral structure of conjugated polymers.

The main objective of the proposed project is the synthesis of new monomers (polymer precursors), and then - polymers - with a three-dimensional structure, characterized by the occurrence of a band gap with a value close to zero. Monomers will be synthesized by the reaction of appropriate arylene anhydrides or dianhydrides with diamines. For example, the use of aromatic *meta*- and *para*-diamines will allow the formation of linear polymers with bis(diimide) units; use of *ortho*-diamines results in the formation of a ladder polymer with five-membered heterocyclic rings (reference systems). We propose the synthesis of monomers produced by annulation of aromatic dianhydrides and 1,8-naphthalenediamine, which results in the presence of perimidine unit in the monomer structure, which we discovered to be involved in oxidative coupling of monomer to polymer structure. In addition, we propose the use of dianhydrides functionalised also in the aromatic core by polymerizable units (e.g. thiophene, pyrrole, EDOT, etc.), which will ultimately enable stiffening of the two-dimensional structure. In addition, increased long-range interactions, involving, inter alia, perimidine molecules may promote supramolecular organization in the third-dimension. In summary, the proper choice of anhydride and amine can result in the formation of a suitable monomer, resulting in a polymer with a planar two-dimensional backbone and significant long-range interactions between the polymer 2D layers, which can ultimately ensure the production of new organic material with high electrical conductivity and low bandgap.