Microelectronics relies on a flow of current to transfer and process information. With increasing degree of miniaturization the current density increases and heat dissipation becomes a major problem. Spintronic devices, based on the manipulation of spin states rather than charge flow of electrons, could offer energy-efficient solutions for future smart information and communication technologies. Spins can either be employed as classical bits of information or as qubits in quantum computing.

The use of single atoms for logic operations represents the true limit of miniaturization; however, it has its limitations. Firstly, atoms have to be arranged on the surface one-by-one and they have to retain their positions for long periods of time which requires temperatures lower than 4.2 K. The indirect magnetic exchange interaction employed is very weak, which limits the operation temperature of the atomic-scale device even further, below 1 K making them not practical for use. Thirdly, the ultimate size of devices made of individual atoms is limited since neighboring atomic- and nano-scale structures be **The objective of this project is to design, on surface synthesize and characterize new salophene based molecules best suited for spintronic devices with atomic-level precision and single-spin sensitivity**.ing too close will interact with the single atoms making up the device. Those interactions would interfere with the operation of the device. To tackle those problems we propose to use planar magnetic molecules instead of single atoms.

Important classes of magnetic molecules include organometallic compounds. Planar molecules usually adsorb in a defined way as well as offer direct access to all parts of the molecular structure by scanning tunneling microscope. Therefore the effective research work is possible with them. Salophene based molecules are very interesting in view of future molecular spintronic devices because they are planar, they can be substituted at the foremost ends by Br to enable on-surface Ullmann coupling (it’s used to bind molecules into more complex structures), and they can incorporate a number of transition metals. Some of these exciting salophene-based molecules can be obtained via standard chemical synthesis methods. Others lack the stability at ambient conditions. In the latter case, our aim is to synthesize such molecules *in-situ* in a ultra-high vacuum (UHV) system by on-surface metalation, a well-known technique to obtain new ogranometalic complexes in UHV conditions.

The objective of this project is to design, on surface synthesize and characterize new salophene based molecules best suited for spintronic devices with atomic-level precision and single-spin sensitivity.