According to the Eric Drexler postulates (Creation Methods, 1984) the essence of the nanotechnology is plan the synthesis process so that the atoms form themselves in the way to create material with expected properties. This process should be preceded by precise ***needs analysis*** which should define expected physical and chemical properties of the material. Next step is to ***design a molecular structure*** of a compound to meet expected properties. What left is to ***plan a synthesis*** to obtain assumed molecular structure. It sounds simple but in most cases it is difficult but not impossible.

Needs analysis indicated that high dense magnetic memory would be very much desirable by contemporary computer systems. Working with mesopourus silica we noticed that its channel regularity can be considered as possible placement of the magnetic units. Our idea is to fill in these channels with a permanent magnet material and use them as memory units. The base of this structure will have a form of the thin film that is made of mosopourus silica with perpendicular regular pores. These pores, also called channels, will have attached magnetic crystallites with ability to be change its magnetization when information bits need to be changed. Reading information will, of course, be possible in the same way. Although formation of such a memory seems to be a complex task, we are convinced that it is feasible. Another challenge is related to the verification of obtained structure. It requires series well thought out fundamental research. Fortunately, initial tests confirmed that it is possible to obtain permanent magnetic structures with dimensions below the superparamagnetic limit. This phenomenon is certainly worth explaining.

The ***goal of the project*** is to synthesize the above mentioned materials and their deep experimental characteristic. The ***scientific hypotheses*** are the following:

1. It is possible to construct a material with complex molecular structure that behaves like a set of independent magnetic units.
2. It is possible to obtain permanent magnetic crystallites with dimensions below 7 nm and break the super paramagnetic limit.
3. It is possible to write and read the magnetic units with a help of the magnetic force microscope (MFM).
4. The spectroscopic and microscopic methods of solids state material testing are able to verify the hypothesis 1.

We are going to use two methods to construct the above mentioned materials. They will be then a subject of the comparative analysis. Therefore we plan to carry out a wide spectrum of the fundamental research like: cyclic voltammetry, TEM microscopy, roentgen reflectometry, SQUID magnetometry and vibrational spectroscopy, supported by DFT simulations.

We believe that a set of tasks related to the project is thoroughly feasible and will enable verification of raised hypothesis as well as complete the project implementation.