Nanotechnology, contrary to the common belief, is not the invention of the 20th century, in fact it has been present throughout human history. Egyptian, 4000year dyeing formula is based on PbS nanocrystals precipitation, which causes the hair blackening. Roman, 4th century Lycurgus cup changes the color of its glass depending on the lightening (the way the light interacts with the surface plasmons of the glass), due to presence of nanoparticles (5-100 nm) made of gold-silver-copper alloy. Damascus sabres from the 17th century, probably known In Alexander the Great times, contains cementite nanowires and carbon nanotubes in its structure. Nanostructures have existed and been used for centuries, unfortunately they have bee invisible even for the best optical microscopes. It wasn't until a few decades ago that we started to understand, that nanosized structures are responsible for specific properties of everyday objects. Modern electron microscopes not only allow the nanostructures to be seen, but also to be penetrated inside. Thanks to the crystal growth technology which uses atomic beams in ultra high vacuum, we are able to change arbitrarily the elemental composition of the deposited material. In means that we are able to create structures of different shapes e.g. the elongated onion-like structures which can be represented by core-shell nanowire with layers of different elemental composition and thickness. The excellent control of the growing process provides continuity of the crystal. The interfaces between each layers have the size of the chemical bond, however the layers can be built of different atoms and have different types of chemical bonds, therefore have different physical properties. Two various crystalline structures, while bonding, have to fit to each other. One of them is stretched and the other is compressed and their chemical bonds start to deform. The stress of the crystals of semiconductor compounds reaches high values around few GPa, which exceeds several times the mechanical strength of the best steels (in macro scale). However, after reaching the specific value of the stress, forces affecting the chemical bonds become too large and the bonds break. The perfect crystalline, periodic structure is destroyed by defects appearance and nano-object undergoes relaxation. Moreover, the homogenous distribution of elastic deflections in nanostructures gets disturbed. The deformation fields of defects can affect the shape of nanowires and change their properties, e.g. the defects can become a trap for charge carriers. The defects also degrade or alter optical and electrical properties of the nano-objects. It turns out that the stresses causing defect generation and relaxation in core-shell nanostructures are bigger than in bulk structures while bonding the same materials. It is still unclear how it happens and how to calculate the required limit values, which is essential for such nanostructures designing. Theoretical predictions trying to estimate the critical thickness of the shell causing the relaxation differ even 10 times from each other. This disparity comes from the lack of experimental data on this topic and it is unknown which assumption of theoreticians are correct. The proposed project will provide important information on this subject. It assumes that the 10-500 nm hetero-nanostructures will be examined by the electron beam of the atomic size diameter, similarly to computer tomography used in medicine. Analyzing the way the electrons diffract on the crystal, we are going to build a 3-dimentional image of the crystal deformation with the resolution of 1nm, which allows us to separate the deformation fields from the single defect. It is impossible to achieve with the use of other techniques, even with the synchrotron radiation method, where the resolution is about 100 nm. Using focused ion beams (FIB) of gallium for preparing cross-section of single hetero-nanostructures will allow us to determine their inner structure with atomic resolution and correlate the distortion of nano-object with defects distribution.