Raman spectroscopy is already a well-established technique used in chemical analysis. With appearance and development of nanotechnology, Raman spectroscopy gained new broad application area. Using modern optics, this tool can provide information about the chemical structure of nano- and micro-sized objects and materials. In this work we used Raman spectroscopy as a universal tool for determination of the chemical bonds and structure of different samples. Three groups of objects were chosen for investigation: carbon-based nanomaterials (performed by single-walled carbon nanotubes and carbon nanowalls), nanostructured bio-derived material, and microstructured through silicon via (TSV). Each of these materials is of prominent interest at the present time and has perspective potential in different fields, like nano- and biosensoric, biomedicine and microelectronics. Single-walled carbon nanotubes (SWNTs) were modified non-covalently by various surfactants for further separation. By use of Raman spectroscopy, their diameter, structure and properties were determined. Another carbon-based nanomaterial, carbon nanowalls, also called vertically grown graphene, was examined in order to learn the number of layers and to see the influence of the substrate on the sample’s structure.

For research of the biological object, mineralized sponge was taken. Possible structure of the inorganic component was proposed. Other type of objects for investigation were through silicon via – silicon wafer with filled with copper vertical interconnects, used usually in 3D packaging in microelectronics. Such devices are known to undergo the local stresses on the surface, which decreases efficiency of the microchips. We used Raman spectroscopy to detect the presence of local stress on the silicon wafer between the copper nails.

This study shows wide possibilities of Raman spectroscopy as analytical technique for nano- and micro-structured materials.