Increased sensitivity of detection of terahertz (THz) signals can be achieved by reducing the size of the sensitive element. Therefore, it is expected that recent advances in nanotechnology may result in cost-effective solutions for new THz detectors. Most attractive are solutions, which can be based on chemically processed nano-scale objects, minimizing the use of relatively expensive fabrication procedures. One particular route is the use of carbon nanotubes (CNTs) that can be easily synthesized in a chemical vapor deposition (CVD) system using inexpensive precursors for the growth. This talk will be devoted to the prospects of using asymmetric CNT devices as a basic element of THz detectors.

We studied response of such devices to terahertz radiation [1, 2]. It was maintained that photothermoelectric effect under certain conditions results in strong response of such devices to terahertz radiation even at room temperature. The asymmetry which is crucial for the observation of the DC voltage response to the radiation has been implemented in our devices in different ways. In most cases devices different metals are used to contact the CNT network of a uniform morphology at the source and drain electrodes. Such devices show the most promising results with room temperature responsivity of up to 100V/W. Analysis of the experimental data shows that the response contains two components. One is thermal reflecting different increase in temperature in the areas of the nanotube/metal interfaces. The second is a response due to the non-linearity of the current-voltage characteristic of the device at zero bias. The rectification of the signal leads to a DC component, which contributes to the observed signals.

Our recent theoretical work [3] has shown excitation of two-dimensional plasmons by incoming THz radiation the detector responsivity can exhibit sharp resonant peaks at the signal frequencies corresponding to the plasmonic resonances in case of devices with lateral CNT networks forming the channel. The prospects opened by this result will be discussed in the talk as well.

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