Fabrication of Nanodevices Using Ultrasonic Nanowelding

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One of the most crucial issues in nanoscience and nanotechnology is to obtain reliable connections between one-dimensional nanomaterials and the external electrical circuits. There is a lot of techniques (diffusion nanobonding, nanosoldering, nanobrazing, fusion nanowelding), among them ultrasonic bonding [1, 2] seems to be promising method for nanoelectronics progress. The ultrasonic bonding has been employed to connect antimony sulfoiodide (SbSI) single nanowires with Au microelectrodes. Characterization of the fabricated nanodevices has been accomplished using scanning electron microscopy (Fig. 1a), atomic force microscopy and electrical investigations (Fig. 1b). After the nanowelding, the ends of the nanowires are no longer visible and were found to be embedded into the electrodes. Increase of the current flowing through the sample has been observed (Fig. 1b) as a result of bonding. It is attributed to the creation of reliable and low resistance contact between SbSI nanowires and metal microelectrodes. The ultrasonic bonding is a convenient, fast, efficient and universal method, that can also be extended to the preparation of dependable connections to other nanomaterials.

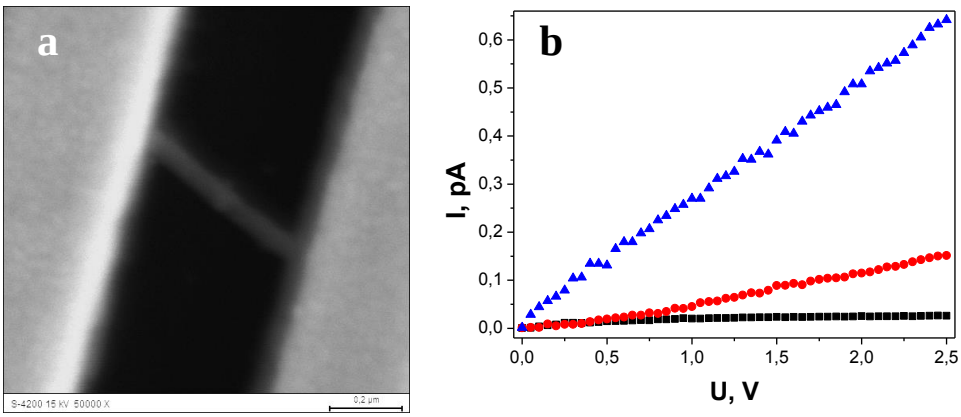

Fig. 1. SEM image of a single SbSI nanowire ultrasonically welded to interdigitated microelectrodes on the Si/SiO_2 substrate (a); Current-voltage characteristics (b) measured for clean substrate (■), after deposition of SbSI nanowires (●), after nanowelding (▲).

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[1] C. Chen, L. Yan, E. Kong, Y. Zhang, *Nanotechnology* **17**, 2192 (2006).
[2] C. Chen, Y. Zhang, *Nanowelded Carbon Nanotubes. From Field-Effect Transistors to Solar Microcells*, Springer Berlin Heidelberg (2009).