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## Radiation technique to control the atomic composition and physical properties of thin film materials for different super conductive and other functional nano-elements production

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The paper describes a technique developed by the authors to create composite micro and nano structures for various purposes from metals, semiconductors, insulators and super conductive materials with different chemical and physical properties. The chemical composition and properties of materials can be controlled by means of ion beam irradiation. The technique is implemented in three ways: by selective removal of atoms (SRA) to produce metals and semiconductors from insulators; the selective displacement of atoms (SDA) to change the atomic composition from one atom to another (to change properties of superconductive materials); and the selective association of atoms (SAA) to produce insulators. Present technique has been successfully used to solve a number of urgent tasks in creating micro and nano devices. We have reached a three dimensional structures resolution of about 15 nm for patterned magnetic media (153 Gb/in2). The metal wires with nanoscale section in dielectric matrix were created. We have demonstrated the transformations of oxides to metals and semiconductors (Cu, W, Co, Bi, Mo, Ta, Ge, etc.,) by SRA technique of nitrides to oxides (Si, Al, Ti, Ga, Nb) by SDA technique; and of pure elements (Si, Al, Ti, Nb) to oxides by SAA technique. We have demonstrated formation of main cryoelectronics elements: resistors, capacitors and planar Josephson junctions from initial superconductive NbN (5 nm) film by using ion beam irradiation and of on chip integrated resistive elements for super conductive single photon detectors (SSPD) with photons number resolution.

## Biography

B A Gurovich is a Full Professor in National Nuclear University (MEPhI). He specializes in the the field of reactor materials science, radiation solid state physics. He is an author of radiation techniques of material properties transformation under ion beam irradiation. He has published more than 150 papers in reputed journals.

## Presenting Author Biography:

K E Prikhodko is working in NRC Kurchatov Institute in the field of structure TEM analysis and ion beam irradiation. He specializes in the field of reactor materials science, radiation solid state physics. He has published more than 60 papers in reputed journals

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