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**Project 1**

**Electrochemical deposition of gold-tin solder alloy from non-aqueous solutions**

Stable and simple in composition ethyleneglycol and propyleneglycol electrolytes based on the usage of Au(III) and Sn(IV) compounds have been developed for electrochemical deposition of gold–tin alloy with the elemental (70 at.% of gold and 30 at.%), phase composition (crystalline phases AuSn, Au5Sn) and microstructure acceptable for the usage in soldering.

Gold-tin alloys containing 70 at.% of gold and 30 at.% of tin are successfully used for packaging of microelectronic and optoelectronic devices due to their excellent thermal and mechanical properties. Gold-tin alloy can be used for junction without the use of the chemical flux, it exhibits good wettability and it has resistance to creep and corrosion and good thermal conductivity.

**Project 2**

**Electroless Gold Plating**

The way for electroless (catalytic) plating of thin gold coatings 0.1-0.3 μm in thick from adjustable stable solutions on a surface of items with Ni-P, Ni-B or Ni-Pd-P sublayers has been developed.

Electroless gold coatings as the finishing coatings can be used in the production of printed circuit boards, printed wiring boards of credit cards, contacts in radio and electronic devices, chip cases, jewellery articles.

**Project 3**

**Using of mono and bimetallic soles of gold and silver in the immune dot-blot assay**

The methods of synthesis and conjugating of gold, silver, bimetall Au–Ag alloy or Au (core) – Ag (shell) nanoparticles and hybrid Au–SnO2 nanoparticles with different proteins such as the rabbit’s antibodies (AB) against immunoglobulines, Shigella’s and Salmonella’s AB have been developed. The methods of qualitative express detection of *Shigella sonnei, Shigella flexneri* antigens with the sensitivity of (2–8)∙102 CFU and also of diphtheria anatoxin with the minimal detectable concentration of 2 ng/cm3 based on the usage of gold sols (dot-blot analysis) have been worked out.