

Arsenic(As)–Silver(Ag), Arsenic(As)–Gold(Au) Antibacterial Nanoparticles

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Arsenic was opted as a well-known widely used medication for a variety of illnesses since more than 2400 years ago [1,2]. Large amount of Arsenic is available in Georgia: Realgar(As_4S_4)-orpiment(As_4S_6) and Arsenopyrite (FeAsS) ore of Georgia are of significant economic importance and they contain important quantities of the precious metals gold(Au), silver(Ag). The antimicrobial properties of silver and gold have been known to cultures all around the world for many centuries. Before we have shown [3] possibilities of removal of arsenic from mineral resources and industrial waste in order to produce important materials with antibacterial properties: Arsenic Antibacterial Polymer Composites Based on Poly(Vinyl Chloride) destroy bacteria[4].

In this study, gold (Au) and silver (Ag) particles size of $d=31\text{nm}$ were modified by Arsenic (As) nanoparticles to form promising novel antibacterial agents in advancements in anticancer activity. In order to obtain antibacterial, anticancer polymeric composites antibacterial agents gold-arsenic as well as silver-arsenic nanoparticles colloid systems were introduced into the different polymeric matrices PVP, PVA. Gold-arsenic, silver-arsenic nanoparticles - polymer matrix systems were characterized with Infra-red spectroscopy (FTIR), Dynamic light scattering (DLS) and electrical microscopy techniques.

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References:

1. Arsenic and Arsenic Compounds SABINA C. GRUND, SMC-Metallurgical Consultant, Dorsten, Germany; KUNIBERT HANUSCH, Hüttenwerke Kayser, Leun, Germany; HANS UWE WOLF, Universität Ulm, Ulm, Germany.
2. Gregson, A. M., Wales, S. M., Bailey, S. J. & Keller, P. A.). Arsenous chloride-free synthesis of cyclic tertiary organoarsines from arylarsine oxides and di-Grignard reagents. *Journal of Organometallic Chemistry*, 2015, p. 785 77-83.
3. W. Brostow, M. Gakhutishvili, R. Gigauri, H. E. Hagg Lobland, S. Japaridze, N. Lekishvili Separation of natural trivalent oxides of arsenic and antimony. *Chemical Engineering Journal*, 2010, N 159, p. 24–26.
4. W. Brostow, St. Brumbley, M. Gakhutishvili, N. Hnatchuk Arsenic Antibacterial Polymer Composites Based on Poly(Vinyl Chloride). *Journal Macromol. Symp.* 2016, 365, 258–262.