



Biosynthesis of Functional Silver Nanoparticles Using Callus and Hairy Root Cultures of *Aristolochia manshuriensis*

Yulia A. Yugay ¹, Maria R. Sorokina ¹, Valeria P. Grigorchuk ¹, Tatiana V. Rusapetova ¹, Vladimir E. Silant'ev ^{2,3}, Anna E. Egorova ⁴, Peter A. Adedibu ⁵, Olesya D. Kudinova ¹, Elena A. Vasyutkina ¹, Vladimir V. Ivanov ⁶, Alexander A. Karabtsov ⁶, Dmitriy V. Mashtalyar ³, Anton I. Degtyarenko ¹, Olga V. Grishchenko ¹, Vadim V. Kumeiko ^{2,7}, Victor P. Bulgakov ¹ and Yury N. Shkryl ^{1,5,*}

¹ Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch of Russian Academy of Sciences, Vladivostok 690022, Russia; yuya1992@mail.ru (Y.A.Y.); sorokina.96@gmail.com (M.R.S.); kera1313@mail.ru (V.P.G.); avramenko.dvo@gmail.com (T.V.R.); olesya55@list.ru (O.D.K.); levina@biosoil.ru (E.A.V.); 77sat7@gmail.com (A.I.D.); crab_ol@mail.ru (O.V.G.); bulgakov@ibss.dvo.ru (V.P.B.)

² Institute of Life Sciences and Biomedicine, Far Eastern Federal University, Vladivostok 690922, Russia; vladimir.silantyev@gmail.com (V.E.S.); vkumeiko@yandex.ru (V.V.K.)

³ Institute of Chemistry, Far Eastern Branch of Russian Academy of Sciences, Vladivostok 690022, Russia; madiva@inbox.ru

⁴ Department of Molecular Diagnostics and Epidemiology, Central Research Institute of Epidemiology, Moscow 111123, Russia; bioanna95@list.ru

⁵ School of Advanced Engineering Studies “Institute of Biotechnology, Bioengineering and Food Systems”, Far Eastern Federal University, Vladivostok 690922, Russia; adeoluadedibu@gmail.com

⁶ Far Eastern Geological Institute, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok 690022, Russia; dom101@mail.ru (V.V.I.); karabzov@fegi.ru (A.A.K.)

⁷ A.V. Zhirmunsky National Scientific Center of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok 690041, Russia

* Correspondence: yn80@mail.ru; Tel.: +007-(423)-231-21-29; Fax: +007-423-2310193

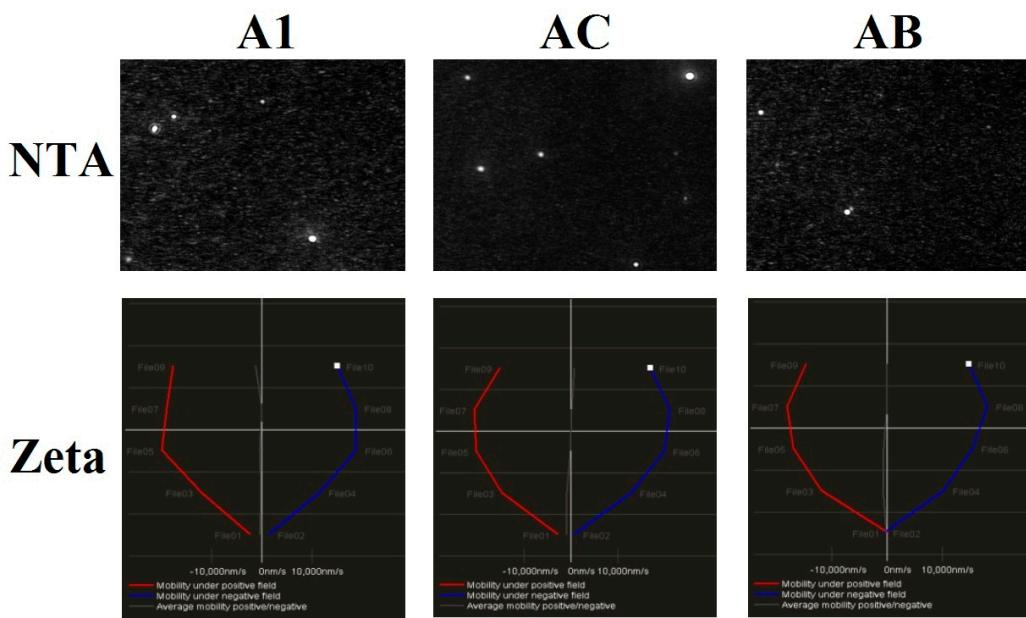


Figure S1. Representative nanoparticle tracking analysis (NTA) video frames and electrical potential (Zeta) measurements.