
Formation specifics and properties of gold particle thin films and arrays deposited on the surface of opal films

© E.V. Panfilova, A.A. Dobronosova

Bauman Moscow State Technical University, Moscow, 105005, Russia

We present a technology for depositing thin films and regular arrays of gold nanoparticles on the surface of opal films. We supply the results of studying the relief parameters in the samples of the resulting structures using a spectrophotometer, an atomic-force microscope and a Raman spectrometer. We determine that by varying the time of depositing the gold it is possible to form on the opal surface either nanometre-scale particle arrays or a continuous gold film following the relief of the opal matrix. We found out that the particle arrays formed have plasmonic structure properties, demonstrating effects of amplifying surface enhanced Raman scattering. The results presented may aid in developing a technology for forming various layered structures and particle systems on the surface of opal matrices, for instance, in manufacturing photonics devices, gas sensor detectors, substrates amplifying surface enhanced Raman scattering, and emission devices.

Keywords: *opal, opal matrix, thin films, nanoparticle arrays, plasmonic nanostructures, physical vapour deposition*

REFERENCES

- [1] Bulygina E.V., Sidorova S.A., Besedina K.N. Issledovanie mikroreliefa tonkoplenochnykh struktur, sformirovannykh na poverkhnosti sinteticheskogo opala [Investigating microrelief of thin-film structures formed on the surface of a synthetic opal]. *Vysokie tekhnologii v promyshlennosti Rossii. Materialy XV mezhdunar. nauch.-tekhn. konf.* [High technology in Russian industry. Proc. of the 15th international scientific and technological conference]. Moscow, Bauman Moscow State Technical University, 9–11 September 2009. Moscow, JSC TECHNOMASH Publ., 2009, pp. 491–493.
 - [2] Besedina K.N., Vostrikova A.V., Dvukhshestova O.O., Kalinin V.N., Panfilova E.V. *Nanoinzheneriya — Nanoengineering*, 2013, no. 12 (30), pp. 36–38.
 - [3] Alekseeva N.O., Veysman V.L., Grebneva L.V., Lukin A.E., Pankova S.V., Solovov V.G., Yanikov M.V. *Vestnik Pskovskogo gosudarstvennogo universiteta. Ser. Estestvennye i fizikomatematicheskie nauki — “Vestnik PskovSU” Magazine (Herald of Pskov State University), Series “Natural and physical and mathematical sciences”*, 2012, no. 1, pp. 176–181.
 - [4] Zhan P., Wang Z.L., Dong H., Sun J., Wu J., Wang H.-T. et al. *Advanced Materials*, 2006, vol. 18, pp. 1612–1616.
 - [5] Ding B., Pemble M.E., Korovin A.V., Peschel U., Romanov S.G. *Applied Physics*, 2011, vol. 103, pp. 889–894.
 - [6] Ding B., Bardosova M., Pemble M.E., Korovin A.V., Peschel U., Romanov S.G. *Advanced Functional Materials*, 2011, vol. 21, pp. 4182–4192.
 - [7] Tsvetkov M.Yu., Bagratashvili V.N., Samoylovich M.I., Khlebtsov N.G., Khlebtsov B.N., Evlashin S.A. SERS podlozhki na osnove samoassemblirovannykh i gibrnidnykh plazmonnykh nanostruktur [SERS substrates based on self-assembling and hybrid plasmonic nanostructures]. *Vysokie tekhnologii v promyshlennosti Rossii. Materialy XV mezhdunar. nauch.-tekhn. konf.* [High technology in Russian industry. Proc. of the 15th international scientific and
-

technological conference]. Moscow, Bauman Moscow State Technical University, 11–13 September, 2014. Moscow, JSC TECHNOMASH Publ., 2014, pp. 368–385.

Panfilova E.V., Cand. Sc. (Eng.), Assoc. Professor, Department of Electron Beam Technologies in Mechanical Engineering, Bauman Moscow State Technical University. Specialises in nanotechnology, colloidal nanostructures, thin films.
e-mail: ev-panfilova@mail.ru

Dobronosova A.A., student, Bauman Moscow State Technical University. Specialises in nanotechnology, thin films. e-mail: dobronosova.bmstu@yandex.ru
