

Large-scale fabrication of ordered metallic hybrid nanostructures

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References

1. M. C. Wanke, O. Lehmann, K. Muller, Q. Wen, and M. Stuke, "Laser rapid prototyping of photonic band-gap microstructures," Science **275**, 1284-1286 (1997). [\[CrossRef\]](#)
2. C. Kuo, J. Shiu, Y. Cho, and P. Chen, "Fabrication of large-area periodic nanopillar arrays for nanoimprint lithography using polymer colloid masks," Adv. Mater. **15**, 1065-1068 (2003). [\[CrossRef\]](#)

3. A. J. Haes and R. P. van Duyne, "A nanoscale optical biosensor: sensitivity and selectivity of an approach based on the localized surface plasmon resonance spectroscopy of triangular silver nanoparticles," *J. Am. Chem. Soc.* 124, 10596-10604 (2002). [\[CrossRef\]](#)
4. K.-B. Lee, S.-J. Park, C. A. Mirkin, J. C. Smirth, and M. Mrksich, "Protein nanoarrays generated by dip-pen nanolithography," *Science* 295, 1702-1705 (2002). [\[CrossRef\]](#)
5. M. Hehn, K. Ounadjela, J.-P. Buncher, F. Rousseaux, D. Decanini, B. Bartenlian, and C. Chappert, "Nanoscale magnetic domains in mesoscopic magnets," *Science* 272, 1782-1785 (1996). [\[CrossRef\]](#)
6. J. Y. Cheng, C. A. Ross, V. Z. H. Chan, E. L. Thomas, R. G. H. Lamertink, and G. J. Vancso, "Fabrication of nanopatterned thin films using self-assembled block copolymer lithography," *Adv. Mater.* 13, 1174-8 (2001). [\[CrossRef\]](#)
7. D. F. P. Pile and D. K. Gramotnev, "Adiabatic and non-adiabatic nano-focusing of plasmons by tapered gap plasmon waveguides," *Appl. Phys. Lett.* 89, 041111/1-4 (2006).
8. V. S. Volkov, S. I. Bozhevolnyi, E. Devaux, J. Y. Laluet, and T. W. Ebbesen, "Wavelength selective nanophotonic components utilizing channel plasmon polaritons," *Nano Lett.* 7, 880-884 (2007). [\[CrossRef\]](#)
9. C. Genet and T. W. Ebbesen, "Light in tiny holes," *Nature* 445, 39-46 (2007). [\[CrossRef\]](#)
10. S. I. Bozhevolnyi, V. S. Volkov, E. Devaux, J.-Y. Laluet, and T. W. Ebbesen, "Channel plasmon subwavelength waveguide components including interferometers and ring resonators," *Nature* 440, 508-511 (2006). [\[CrossRef\]](#)
11. J. Dintinger, S. Klein, and T. W. Ebbesen, "Molecule-surface plasmon interactions in hole arrays: enhanced absorption, refractive index changes, and all-optical switching," *Adv. Mater.* 18, 1267-1270 (2006). [\[CrossRef\]](#)
12. A. J. Haes, W. P. Hall, L. Chang, W. L. Klein, and R. P. V. Duyne, "A localized surface plasmon resonance biosensor: first steps toward an assay for Alzheimer's disease," *Nano Lett.* 4, 1029-1034 (2004). [\[CrossRef\]](#)
13. T. Ito and S. Okazaki, "Pushing the limits of lithography," *Nature* 406, 1027-1031(2000). [\[CrossRef\]](#)
14. A. K. Srivastava, S. Madhavi, T. J. White, and R. V. Ramanujan, "Template assisted assembly of cobalt nanobowl arrays," *J. Mater. Chem.* 15, 4424-4428 (2005). [\[CrossRef\]](#)
15. X. Wang, E. Graugnard, J. S. King, Z. Wang, and C. J. Summers, "Large-scale fabrication of ordered nanobowl arrays," *Nano Lett.* 4, 2223-2226 (2004). [\[CrossRef\]](#)
16. S. Wang, D. F. P. Pile, C. Sun, and X. Zhang, "Nanopin plasmonic resonator array and its optical properties," *Nano Lett.* 7, 1076-1080 (2007). [\[CrossRef\]](#)
17. C. Shin, W. Shin, and H.-G. Hong, "Electrochemical fabrication and electrocatalytic characteristics studies of gold nanopillar array electrode (AuNPE) for development of a novel electrochemical sensor," *Electrochimica Acta* 53, 720-728 (2007). [\[CrossRef\]](#)
18. X.-Y. Wang, H. Zhong, J.-H. Yuan, D. Sheng, X. Ma, J.-J. Xu, and H.-Y. Chen, "Direct Electrochemical Fabrication of Metallic Nanopillar Array on Au Electrode Surface by the Template Technique," *Chem. Lett.* 33, 982-985 (2004). [\[CrossRef\]](#)
19. R. Micheletto, H. Fukuda, and M. Ohtsut, "A Simple Method for the Production of a Two-Dimensional, Ordered Array of Small Latex Particles," *Langmuir* 11, 3333-3336 (1996). [\[CrossRef\]](#)
20. W. J. Wang, G. H. Lim, W. D. Song, K. D. Ye, J. Zhou, M. H. Hong, and B. Liu, "Laser induced nanobump array on magnetic glass disk for low flying height application," *J. Phys.: Conference Series* 59, 177-180 (2007).

Abstract

A low-cost and high-throughput method for the fabrication of large-area ordered hybrid metallic nanostructure arrays is presented. Each structure unit is a nanobowl with a hexagonal distributed pillar array upon it. A self-assembled monolayer of polystyrene (PS) nanospheres is used as a template. After thermal evaporation, electroforming and removal of the nanospheres and the conductive layer, ordered arrays of hybrid nickel nanostructures have been fabricated. Both nanobowl arrays and pillar arrays exhibit uniform sizes. Smooth interior surfaces were observed in the nanobowl arrays. The geometry of the structure can be tuned by controlling the thickness of the conductive layer. The approach presented in this paper can be extended to fabricate ordered hybrid nanostructures of a wide range of metals and alloys with controlled size.

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