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Fabrication of hexagonally ordered nanometer-scaled triangular platinum island using polystyrene beads bridge phenomena

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The nanometer-scaled materials have used for fabricating nanostructure so far and one of these, polystyrene beads, has many advantages for fabrication of nanostructure. For example, it could be fabricated for particular pattern array structure using for self-assembled monolayer property. Futhermore, the polystyrene beads could be integrated with existing semiconductor process technology because it has superior compatibility with silicon substrate. In our experiment, the spin coating was used for well-ordered array of polystyrene beads. The polystyrene beads could be reduced its sizes using oxygen plasma ashing process. During the plasma ashing process, polystyrene beads bridges phenomena occurred between adjacent beads according to the ashing conditions such as microwave power, ashing gas source, and ashing time. We believed that the main reason for the occurrence of polystyrene beads bridges during plasma ashing process is that the polystyrene beads on the Si surface were not sufficiently ashed by plasma. The metal thin film, platinum, was deposited on the Si with the array of ashed polystyrene beads by ion sputtering and the polystyrene beads used deposition mask was removed by ultra sonication process and cotton bud. The space of between ashed polystyrene beads were had with triangular structures and between the adjacent polystyrene beads distances could be had under 35 nm. After the metal deposition based on the ash polystyrene beads mask, the nanometer-scaled hexagonally triangular island could be obtained with dimension less than 45 nm^2. Consequently we have expected that the triangular island have possibility application of nanometer-scaled device such as nano floating gate memory and biosensors.