A Study on Microstructure Fabrication by Imprint Lithography at Room Temperature and its Application to Graphoepitaxy

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This doctoral thesis consists of imprint lithography at room temperature and its application to lateral-graphoepitaxy.

Imprint lithography, which fabricate microstructures by pressing molds, has attracted considerable attention from the viewpoint of low cost fabrication, because exposure systems are not required. Up to now, conventional imprint lithography schemes rely on thermal processes at high temperature or ultraviolet (UV) light exposures during pressing of molds to substrates, which are spin-coated with photoresist. In addition, selectivity of photoresist, which is used for imprint lithography, to substrates for dry etching has been low. In this research, we develop imprint lithography at room temperature using novolak-type photoresist, which has high selectivity to substrates for dry etching. The developed imprint lithography does not need neither heating substrates nor UV light exposures during pressing molds to substrates coated with photoresist.

Graphoepitaxy attracts considerable attention as an epitaxial growth technology to form single-crystalline thin films on noncrystalline substrates whose surfaces have microstructures. If more flat semiconductor surfaces are obtained, applications of graphoepitaxy are expected to expand. In this research, single-crystalline germanium (Ge) is grown as a seed crystal on SiO_2 surface with microstructures, which are formed by the newly developed imprint lithography at room temperature. By laterally scanning heating region, single-crystalline Ge is successfully grown on flat SiO_2 surface.