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Properties of InAs nanocrystals in silicon formed by sequential ion implantation.

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Optical and structural properties of InAs nanocrystals fabricated by co-implantation of In and As ions in Si-c (100), followed by thermal annealing are investigated. In the first sample named Si/AsIn the implantation of As ions was followed by In ion implantation, whereas in the second sample named Si/InAs the order of implantation was inverted. RBS spectra of these samples taken before and after annealing show that the depth profiles of implanted ions depend strongly on the order of implantation. XRD measurements confirm the presence of InAs crystallites oriented along the crystallographic axes of the silicon matrix irrespective of the order of implantation. Alignment and strain in the InAs nanocrystals were investigated through ion channelling in (100), (110), and (111) directions. These results, as well as those of photoluminescence and optical absorption measurements indicate that the average size and size distribution of the resultant nanocrystals are strongly dependent on the order of ion implantation.

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