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VLS growth of <111> oriented Silicon nanowires on Si (111) and Si (100); Growth rate dependence of growth defects JOONHO BAE, Physics Department, University of Texas at Austin, SHAWN COFFEE, JOHN EKERDT, Department of Chemical Engineering, University of Texas at Austin, CHIH KANG SHIH, Physics Department, University of Texas at Austin — Recently, models have been developed to explain the relation between the growth direction and the diameter of VLS grown silicon nanowires. In this study, we present experimental evidences showing growth rate dependence of growth defects such as bending and kink formation of silicon nanowires grown by $SiCl_4$ as a precursor and H_2 as a carrier gas. We find that the high growth rate tends to result in nanowires with less growth defects permitting well oriented nanowires. By applying this finding and controlling growth conditions, large area silicon nanowires along <111> direction were successfully demonstrated on Si (111) and Si (100) substrates. On Si (111) substrates, we achieve large area vertically aligned [111] oriented nanowires. On Si (100) substates, nanowires with four different <111> orientations form a large area of inter-lacing network pattern. The underlying growth mechanism and pattern formation are discussed.

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