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# Direct determination of surface stress during Ge growth on Si(111)

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The importance of surface stress as a factor in the surface reconstruction is beginning to be widely recognized in modern nanotechnology. The Si(111)-7x7 reconstructed surface is well known to be based on the dangling bonds reduction and adatom formation. The surface reconstruction should result in different surface stress from the bulk one, while the reconstruction should be affected directly by the stress. The surfaces of Si(111) and Ge(111) show that transitions between different reconstructions can be induced by external stress, applied either directly by heteroepitaxial growth of a layer of material on a lattice mismatched substrate. We have focused on measurement of the absolute surface stress in Si(111)-7x7 and Ge(111)-5x5 wetting layer on Si(111) substrate by comparing these surfaces to reference H-terminated 1x1 surfaces. The stress behavior and surface structure were observed simultaneously by using real-time measurement of substrate curvature and reflection high energy electron diffraction (RHEED) methods. At the beginning of the atomic hydrogen exposition on Si(111)-7x7 and Ge(111)-5x5 surfaces, distinct compressive stresses are observed corresponding to the formation of H-termination. After the above treatment, a complete transformation of the surface structure occurs from each reconstructed surface to the 1x1 one. These results show the effect of surface reconstruction, which can drive changes in the surface stress during the Ge heteroepitaxial growth on the Si substrate.