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Silicene Evolution from Silicon Herringbones on Ru(0001) YANFANG ZHANG, Institute of Physics, Chinese Academy of Sciences, China, LI HUANG, Institute of Chemistry, and Institute of Physics, Chinese Academy of Sciences, China, WENYAN XU, YANDE QUE, EN LI, JINBO PAN, SHIXUAN DU, Institute of Physics, Chinese Academy of Sciences, China, YUNQI LIU, Institute of Chemistry, Chinese Academy of Sciences, China, YUYANG ZHANG, SOKRATES T. PANTELIDES, Vanderbilt University, United States, HONGJUN GAO, Institute of Chemistry, Chinese Academy of Sciences, China — Silicon-based 2D materials can potentionally be integrated into Si-based electronics. Buckled silicene, an analog of graphene, was recently fabricated on a Ag (111) substrate and used to make a field effect transistor. Here, we report that, when Ru (0001) is used as a substrate, low Si coverage produces a herringbone structure, a new silicon phase. With increasing Si coverage, the elbow sites of the herringbone develop into nucleation sites of silicene. At even higher coverage, narrow Si ribbons with honeycomb structure develop between herringbones. Finally, with even higher Si coverage, a ($\sqrt{3}$ x$\sqrt{3}$) silicene monolayer forms in registry on ($\sqrt{7}$ x$\sqrt{7}$) Ru(0001). Scanning tunneling microscopy (STM) was used to image the structures. The growth process was confirmed by density functional theory (DFT) calculations. This work may contribute to precise control of growth of silicene and other silicon structures.

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