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Formation of Silicon Carbide Y Junctions by the Coalescence of Catalysts ZHENYU LIU, JUDITH C. YANG, Department of Mechanical Engineering and Materials Science, University of Pittsburgh, Pittsburgh, 15261 PA, USA, V. SROT, PETER A. VAN AKEN, M. RÜHLE, Max-Planck-Institute for Materials Research, Heisenbergstrasse 3, D-70569, Germany — We previously reported the formation of crystalline SiC nanocones by the released iron catalytic procedure, where the initially carbon- encapsulated iron nanoparticles escape from their carbon shells and agglomerate while catalyzing 1D SiC growth. Here we show that the coalescence of the iron nanoparticles can lead to Y junctions. Y junctions where the SiC branches are either parallel or inclined with respect to each other have been observed by scanning electron microscopy (SEM) and high resolution transmission electron microscopy (HRTEM). The microstructure of the resulting products is analyzed by various techniques, including X-ray diffraction (XRD), energy dispersive X-ray spectroscopy (EDS) as well as electron energy loss spectroscopy (EELS). The Y junction with two parallel branches of various diameters suggests that the Y junction can be induced by the growth kinetics attributed to the diameter dependence, such as by the Gibbs-Thomson or surface tension effect. The proposed formation mechanism of Y junctions by the coalescence of catalyst droplets is a promising method to the construction of heterostructure nanowire devices.

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