

Fragmentation of nanowires driven by Rayleigh instability

Toimil-Molares ME, Balogh AG, Cornelius TW, Neumann R, Trautmann C
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Rayleigh instability of copper nanowires has been experimentally demonstrated. After annealing 30-50-nm-diam wires at temperatures between 400 and 600°C, different stages of the fragmentation process are observed by scanning electron microscopy. At 400°C, the wires start to fragment, forming shorter sections at 500°C, and finally decaying into a chain of nanospheres at 600°C. Average diameter and spacing of the spheres are in agreement with theoretical predictions. The Rayleigh instability applied to nanowires provides a structuring technique producing long chains of nanospheres, which should find interesting applications, for instance, by guiding light below the diffraction limit via coherent coupling of surface-plasmon polaritons.