

Research Highlights

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Graphene: Ironing out the edges

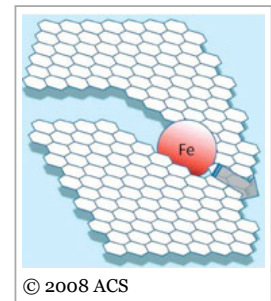
Tim Reid

Hot iron nanoparticles could be used to carve electronic circuits out of graphene sheets

The excellent electronic properties of graphene have prompted scientists to try cutting it into 'nanoribbons', which might be used in electronic devices of the future. Attempts with lithography, however, have left rough edges to the nanoribbons that could affect their performance. Now Douglas Strachan, Charlie Johnson and co-workers at the University of Pennsylvania¹ have developed a new etching technique that uses hot iron nanoparticles to carve out patterns in graphene sheets.

The researchers deposited flakes of graphene onto a silicon substrate, coated them in iron nitrate solution, and heated them in a hydrogen and argon gas flow. At 900° C, the iron formed particles with diameters of about 15 nm, which diffused across the surface, etching away trenches in the graphene sheets.

By identifying areas where two iron nanoparticles travelled on parallel tracks, the researchers managed to isolate nanoribbons as narrow as 15 nm and up to a few micrometres long. The researchers found that the nanoparticles travel predominantly along a single direction, although it was not clear why this direction was preferred. However, the existence of other paths at angles of 30° and 60° to the preferred direction suggests that the motion of the iron nanoparticles — and hence the etching — is related to the honeycomb lattice of the graphene, which could be exploited in the fabrication of devices and circuits.



Reference

1. Datta, S. S., Strachan, D. R., Khamis, S. M. & Johnson, A. T. C. Crystallographic etching of few-layer graphene. *Nano Lett.* doi: 10.1021/nl080583r (2008). | [Article](#) |

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