Colloquium on Polymer Science and Molecular Engineering Zhejiang University and the University of Chicago
12-16 April 2017

Highly Electrically Conductive / Superconducting Graphene Fibers Via Doping Strategy

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Abstract:

Graphene fibers (GFs) are hoped to inherit the exceptional electrical conductivity of single graphene sheet. However, the inferior conductive performance of GFs ever achieved still lower than that of graphene. Here, we reported highly electrically conductive and superconducting GFs via efficient chemical doping strategy. Our doped GFs are useful as conductive cables to transmit power and signals with efficiency high enough to substitute metal conductors.

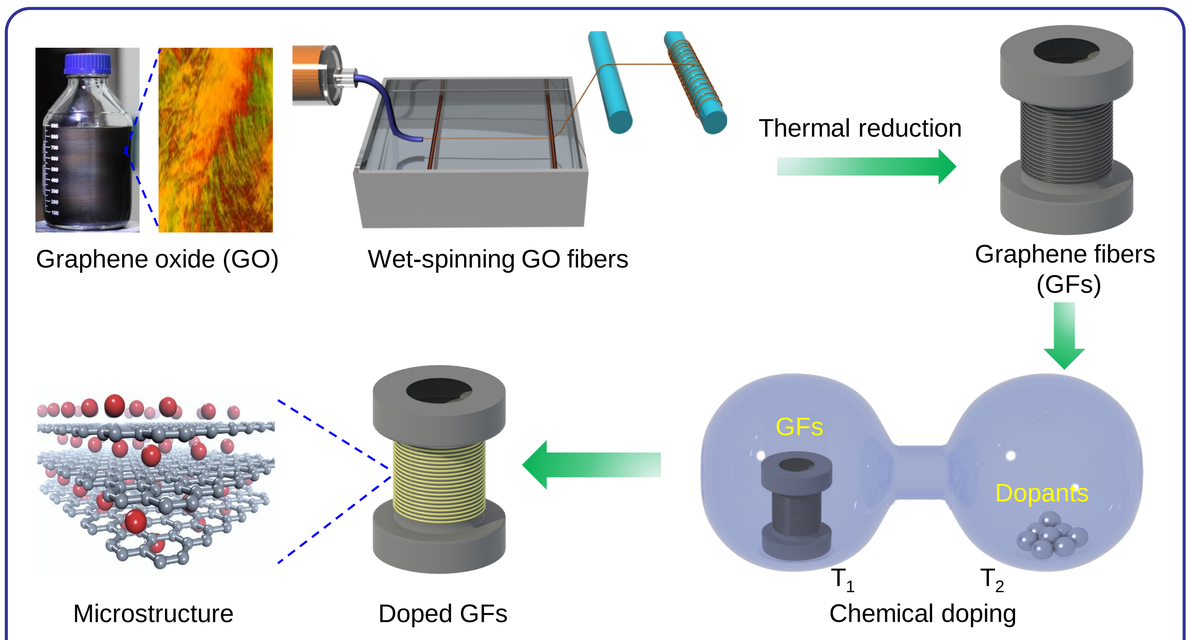

Fig. 1. Schematic diagram of the fabrication process of chemically doped GFs.

Superconducting Ca-doped GFs

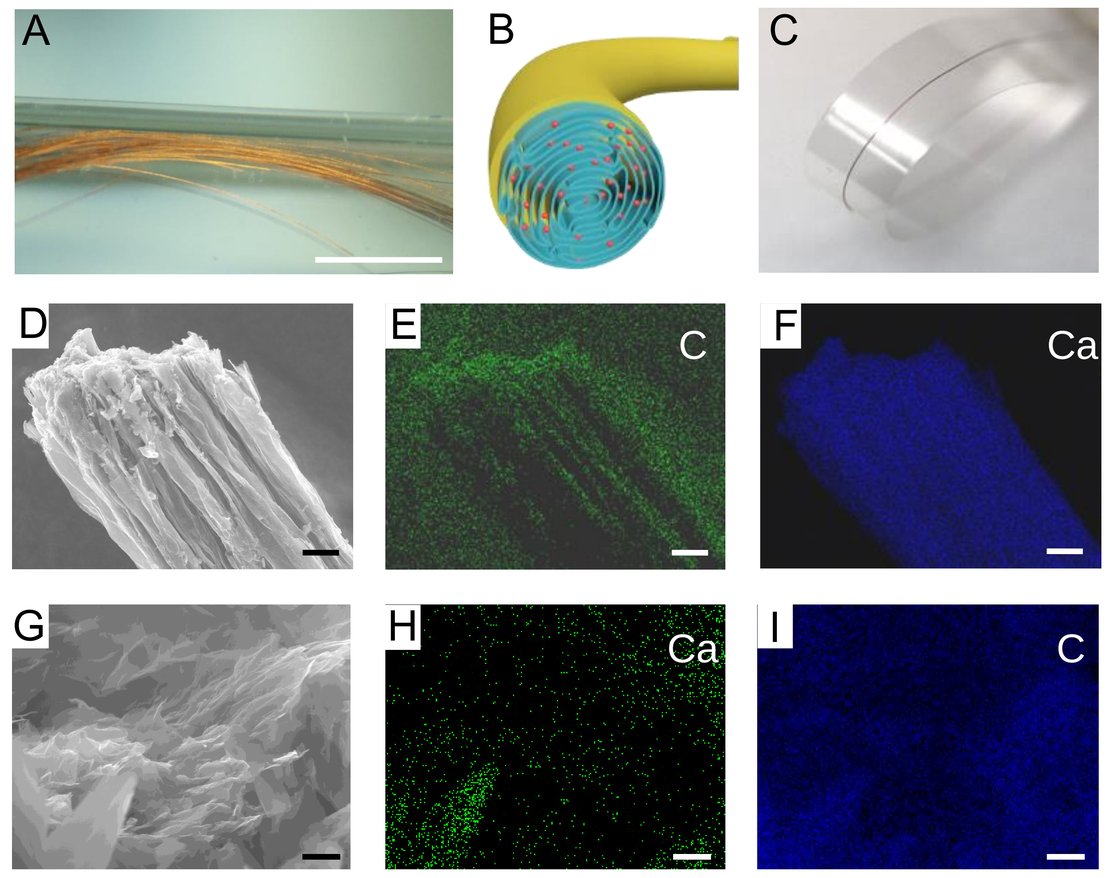

Fig. 3. (A) Photo of Ca-GFs. (B) Schemetic structure of Ca-GF. (C) Bending a Ca-GF on a transparent substrate. (D-I) SEM images and elemental mapping images of Ca-GF.

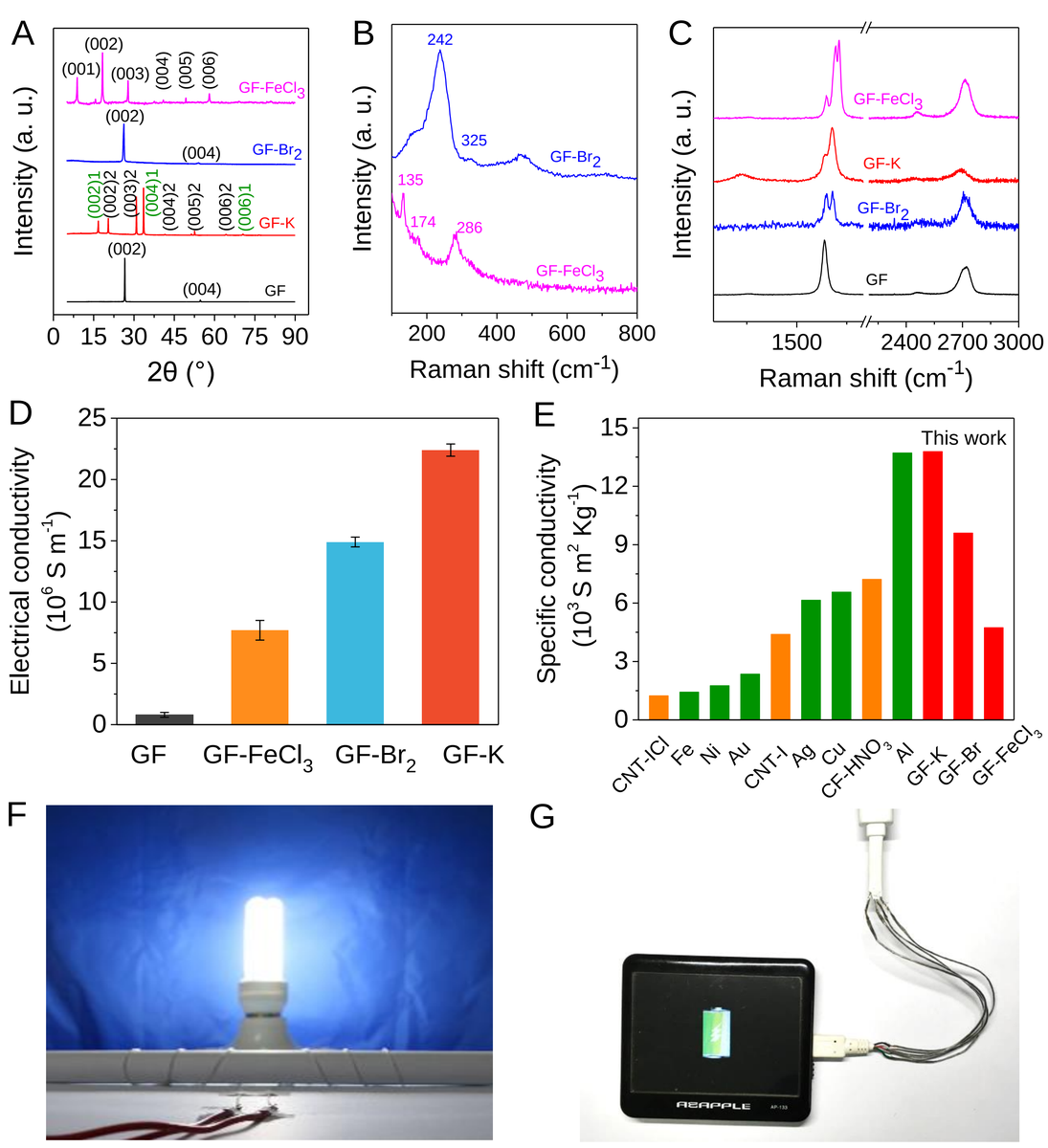

Fig.2 (A-C) Structural characterization of chemical doped GFs. (D-E) Electrical conductive performance of doped GFs. (F-G) Applications of doped GFs as lightweight conducting wire and USB cables.

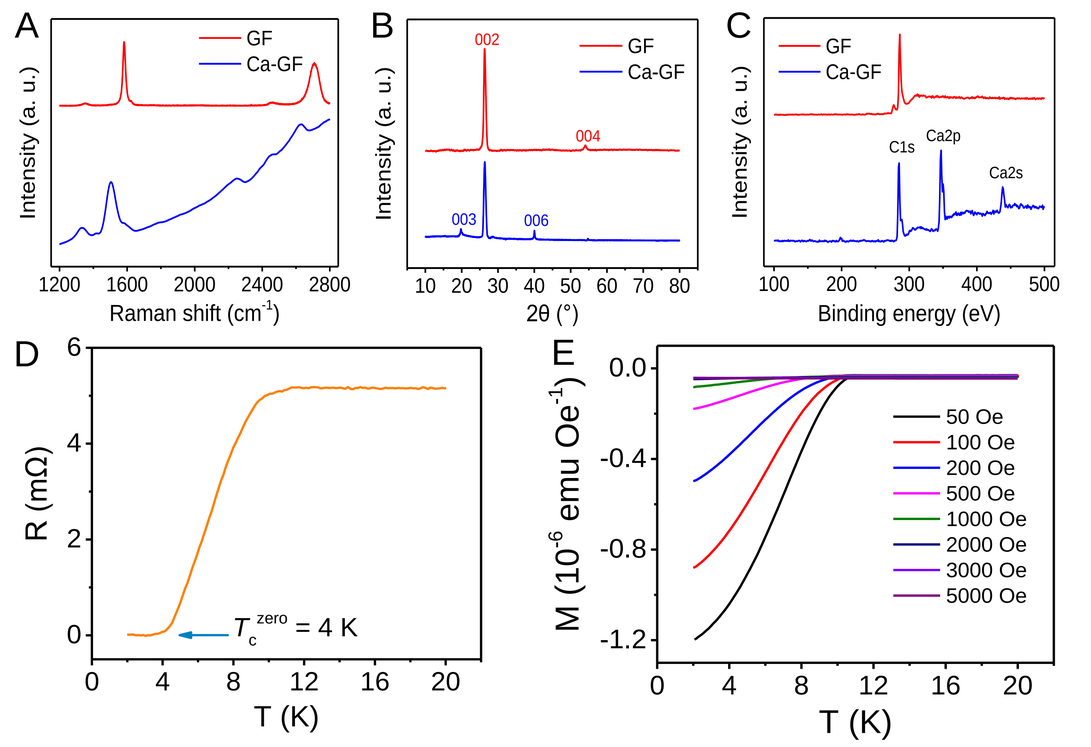

Fig. 4. (A-C) Raman spectra (A), XRD patterns (B) and XPS spectra (C) of GF and Ca-GF. (D) R-T curve for Ca-GF, showing a superconducting transition with T_c^{onset} = 11.3 K and T_c^{zero} = 4 K. (E) *M-T* curves for Ca-GF under different applied magnetic fields.

Conclusions

- **Ultrahigh electrically conductive and superconducting GFs were fabricated via a facile chemical doping strategy.**
- **The combination of outstanding electrically conductive performance, lightness and easy scalability renders GFs remarkable potential in the field of smart wearable devices and electrical engineering.**

Acknowledgement

National Natural Science Foundation of China (Nos. 21325417, 51533008, 21622407, 51603183) and MOST National Key Research and Development Plan (2016YFA0200200).

References

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2. Y. Liu, H. Liang, Z. Xu, J. Xi, G. Chen, W. Gao, M. Xue, C. Gao. ACS Nano 2017, DOI: 10.1021/acsnano.7b01491.