Low-cost CVD graphene: canvas for fabricating ultrasensitive nano-island sensors (strain, chemical, biological) with high potential for industrialization.

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This work describes an effect based on the wetting transparency of graphene: the morphology of a metallic film (≤20 nm) when deposited on graphene by evaporation depends strongly on the identity of the substrate supporting the graphene. This control permits the formation of a range of geometries: tightly packed nanospheres, nanocrystals, and island-like formations with controllable gaps down to 3 nm. These graphene-supported structures can be transferred to any surface and function as ultra-sensitive mechanical signal transducers with high sensitivity and range (at least four orders of magnitude of strain) for applications in structural health monitoring, electronic skin, measurement of the contractions of cardiomyocytes, and substrates for surface-enhanced Raman scattering (SERS, including on the tips of optical fibers). These composite films can thus be treated as a platform technology for multimodal sensing. Moreover, they are low profile, mechanically robust, semitransparent, and have the potential for reproducible manufacturing over large areas.

References

1) Zaretski, A. V *et al. Nanotechnology* **26,** 45301 (2015).
2) Zaretski, A. V *et al. Nanoletters* **16 (2),** 1375-1380

Figures

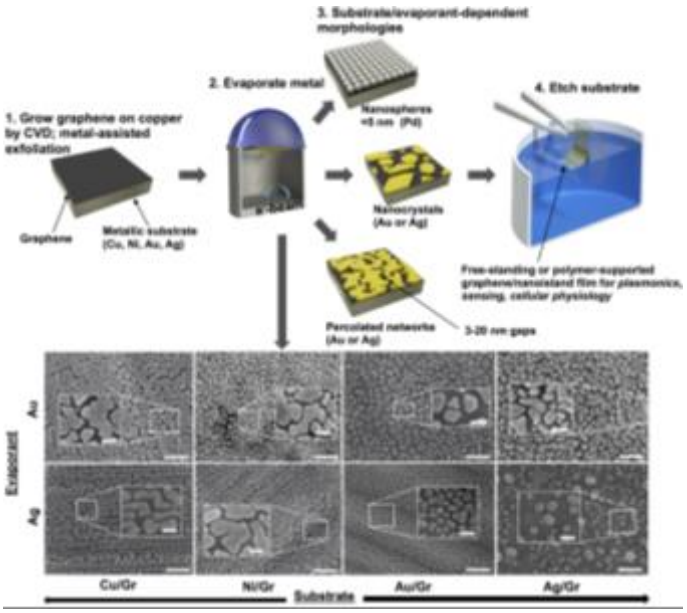

Figure 1: Schematic diagram of the process used to generate nanoislands (top) and scanning electron micrographs of metallic nanoislands on various substrates obtained by electron beam evaporation of evaporant (y-axis) onto a graphene/metal substrate (x-axis) (bottom).

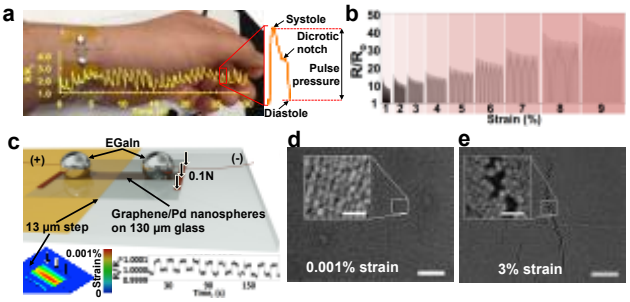

Figure 2: Nanoisland strain sensors.