

# Fully Scalable Printed Graphene Transistor Arrays for Healthcare Applications

Arnab Maity, Yana Milyutin, Hossam Haick

Department of Chemical Engineering and Russell Berrie Nanotechnology Institute, Technion - Israel Institute of Technology, 3200003, Haifa, Israel

Recently graphene based flexible printed nanoelectronics draws great attention for their tremendous potential in various real-life applications for industry and healthcare. Here, we developed fully scalable multifunctional graphene ink printable on wide range substrate, such as, Silicon wafer, paper, Kapton, PET, glass with excellent control in printed geometry and uniformity for large scale (meter) printing capability with sub ppb level VOC sensing capability.

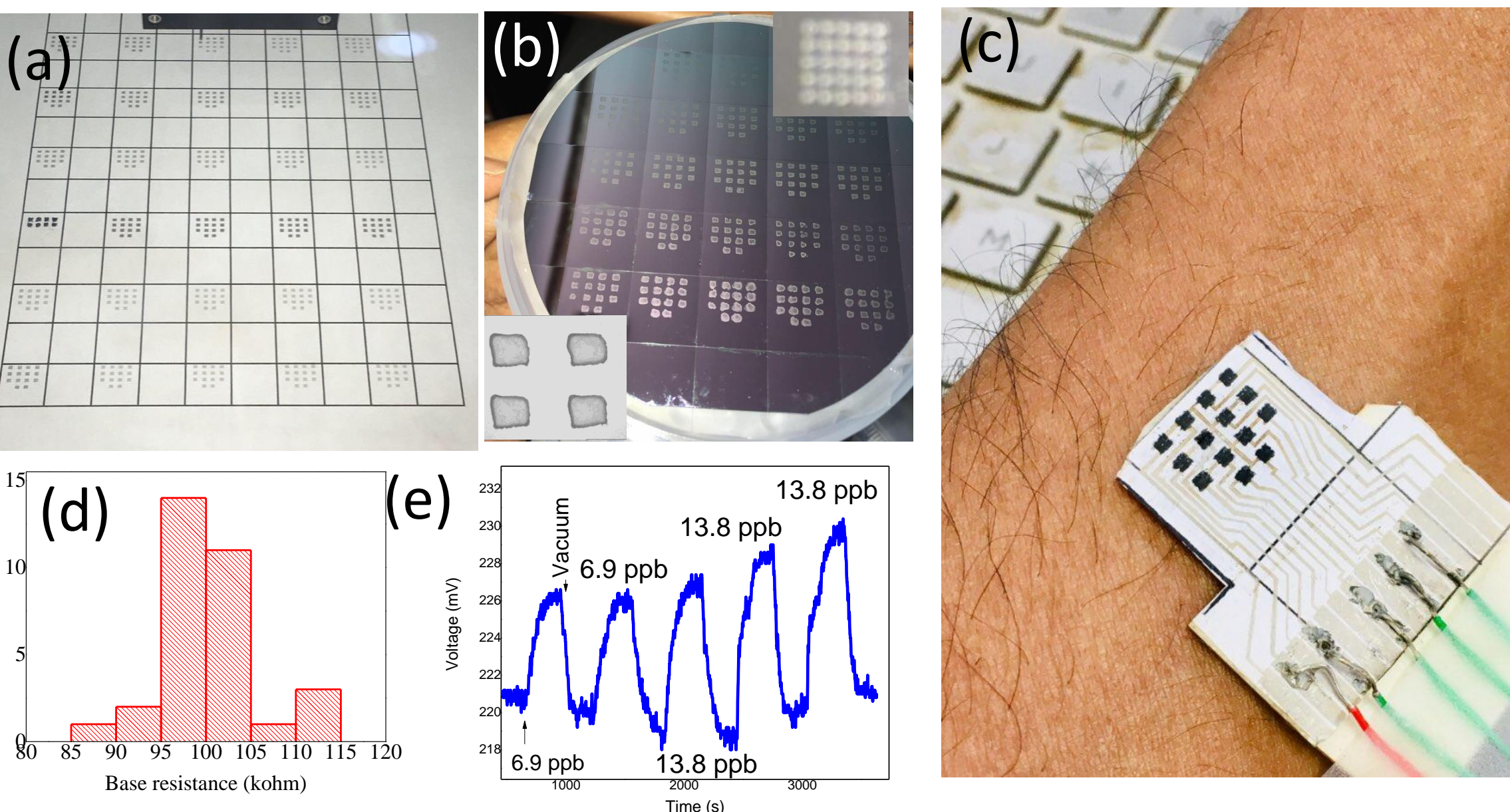


Fig. Mass Scale printed pattern on (a) paper and (b) silicon wafer, The magnified printed pattern is shown in the inset, (c) The optical image of printed sensor array implanted on skin, (d) Statistical distribution of resistance of the printed sensor, (e) The typical sub ppb level characteristics and reversibility test of printed sensors for ethyl alcohol.

## Features of our printed sensor technology:

- ❑ The formulation of the engineered graphene ink could be dispersed in **wide range solution medium** (aquas and non-aquas) without using any surfactant.
- ❑ The printed pattern is **fully scalable for mass-scale** printing (meter) with typical device resistance range ( $100 \text{ kohm} \pm 5 \text{ kohm}$ ) and suitable for large area and long time printing.
- ❑ No additives/binder/high boiling point solvent/aggressive chemical were used and therefore **fully sustainable**.
- ❑ No post printing thermal annealing is needed, therefore, **suitable for any substrate** (rigid or flexible, like paper, plastic).
- ❑ **High efficiency VOC based bio-marker** sensing capability (sub ppb to ppt level) in single and mix VOC condition (12 or more).
- ❑ Suitable for **various wearable application** for human physiological parameter monitoring

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