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Alternative polymer scaffolds for clean transfer of CVD-grown graphene JOSHUA WOOD, GREGORY DOIDGE, BASIL ARUIN, HEFEI DONG, JUSTIN KOEPKE, ENRIQUE CARRION, ISHA DATYE, KAMALIKA CHATTERJEE, JEFFREY MOORE, ERIC POP, JOSEPH LYDING, University of Illinois at Urbana-Champaign — We investigate and benchmark polymer scaffolds used to support large-area chemical vapor deposition (CVD) grown graphene on Cu during transfer. CVD graphene must be transferred off of Cu to be used in various applications. PMMA transfers introduce hard-to-remove residues, and thermal release tape transfers have removable residue but give holey graphene films. Films transferred by poly(bisphenol A carbonate) (PC) are atomically clean after room-temperature polymer dissolution, and we confirm this by atomic force microscopy, Raman spectroscopy, device transport, and scanning tunneling microscopy. Compared to PC-, PMMA-transferred films have fewer wrinkles but higher RMS roughness. When we use a PC/PMMA bilayer, we find lower graphene wrinkle density but higher RMS roughness from polymer co-mixing. We also transfer graphene with other industrially relevant scaffolds like polylactic acid (PLA) and chemically modified photoresists. PLA-transferred films, after polymer dissolution, have sub-nm RMS roughness, and this improves upon PLA gasification above 180 °C. Graphene transfer polymers that require low thermal budgets will open possibilities for temperature-sensitive substrates or graphene encapsulation of biological specimens (e.g. viruses, bacteria).

Joshua Wood
University of Illinois at Urbana-Champaign

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