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Ultra-Clean Patterned Transfer of Single-Layer Graphene by Recyclable Pressure Sensitive Adhesive Films

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We report an ultraclean, cost-effective, and easily scalable method of transferring and patterning large-area graphene using pressure sensitive adhesive films (PSAFs) at room temperature. This simple transfer is enabled by the difference in wettability and adhesion energy of graphene with respect to PSAF and a target substrate. The PSAF transferred graphene is found to be free from residues, and shows excellent charge carrier mobility as high as ~17,700 $cm^2/V \cdot s$ with less doping compared to the graphene transferred by thermal release tape (TRT) or poly(methyl methacrylate) (PMMA) as well as good uniformity over large areas. In addition, the sheet resistance of graphene transferred by recycled PSAF does not change considerably up to 4 times, which would be advantageous for more cost-effective and environmentally friendly production of large-area graphene films for practical applications.

Keywords: clean transfer, supporting polymer recycle, graphene patterning, surface wetting, adhesion energy

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Sr-doped AlOx gate dielectrics enabling high-performance flexible transparent thin film transistors by sol-gel process

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Metal-oxide thin-film transistors (TFTs) have gained a considerable interest in transparent electronics owing to their high optical transparency and outstanding electrical performance even in an amorphous state. Also, these metal-oxide materials can be solution-processed at a low temperature by using deep ultraviolet (DUV) induced photochemical activation allowing facile integration on flexible substrates [1]. In addition, high-dielectric constant (k) inorganic gate dielectrics are also of a great interest as a key element to lower the operating voltage and as well as the formation of coherent interface with the oxide semiconductors, which may lead to a considerable improvement in the TFT performance.

In this study, we investigated the electrical properties of solution-processed high-k strontium-doped AlOx (Sr-AlOx) gate dielectrics. Using the Sr-AlOx as a gate dielectric, indium-gallium-zinc oxide (IGZO) TFTs were fabricated and their electrical properties are analyzed. We demonstrate IGZO TFTs with a 10-nm-thick Sr-AlOx gate dielectric which can be operated at a low voltage (~5 V).

Keywords: Metal-Oxide TFT, Sr-AlOx, IGZO