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Flexible printed humidity sensor based on poly(3,4-ethylenedioxythiophene)/ reduced graphene oxide /Au nanoparticles with high performance

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ABSTRACT: Wearable and flexible humidity-sensing devices are essential for the real-time monitoring of air humidity in health and environmental applications. We propose a flexible sensor based on a conductive polymer comprising poly(3,4-ethylenedioxythiophene) (PEDOT) and reduced graphene oxide(rGO) to monitor changes in humidity. GO was used as a hard template for the *in situ* polymerization of EDOT to obtain PEDOT:rGO. Then, PEDOT:rGO-PEI/Au nanoparticles (NPs) ink was prepared through the *in situ* reduction of Au NPs modified with polyethylenimine (PEI). The ink was printed on the surface of a hydrophilic modified polyethylene terephthalate (PET) substrate using an ink-jet printer to form a specific pattern. After assembly, a PET-based PEDOT:rGO-PEI/Au NPs (PrGANPs) sensor device with high electrical performance, transparency, and sensitivity was obtained for testing at a variety of RH levels. The prepared PET-based PrGANPs sensor printed with