MECHANOCHEMICALLY FUNCTIONALIZED WASTE PLASTICS FOR NO_2 SENSING

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Non-depolymerizing upcycling of waste plastics into value-added products is promising, as it can avoid energy-intensive depolymerization process. Here, we report a mechanochemical approach for the **direct functionalization of plastics with polyoxometalate (POM) molecules**. The resulting POM-plastic composites retain integrated plastic chains and exhibit strong potential for NO_2 sensing. Among the composites, phosphotungstic acid/polyethylene terephthalate (PW_{12}-PET) achieves a low limit of detection (10.52 ppb) and fast response/recovery times (19.2 s/13.5 s at 5.0 ppm). It outperforms reported NO_2 sensors and shows practical applicability after device assembly. Moreover, it exhibits high selectivity against ten interfering gases. Mechanistic studies reveal that PET transfers multiple charges to PW_{12}. It not only activates new bridge-oxygen sites on PW_{12} but also maintains a moderate adsorption strength, enabling rapid NO_2 response. **This work would spark widespread interests in the direct non-depolymerizing upcycling of waste plastics into value-added functional materials.**