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Magnetic carbon nanotubes prepared from LDPE, HDPE and PP

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Plastics are among the most generated solid wastes, predominantly composed by polymers, as low-density polyethylene (LDPE), high-density polyethylene (HDPE), and polypropylene (PP).¹ This work deals with the preparation of magnetic carbon nanotubes (CNTs) by catalytic chemical vapor deposition (CCVD) at 850 °C, considering LDPE, HDPE and PP as carbon precursors representative of urban plastic solid waste in a perspective of circular economy.¹ Magnetite supported in alumina nanoparticles previously synthesized by sol-gel were used as catalysts in the CCVD process. Afterward, each synthesized CNT was washed with 50% H₂SO₄ at 140 °C during 3 h to remove the remaining magnetite, following methods previously described.² The successful removal of the magnetite particles was assessed measuring the ashes content of the CNTs, removals higher than 83% being achieved (ashes content of final CNT products ranging from 4.2 to 7.9%). The remaining catalyst was located inside the CNTs, conferring magnetic properties to the materials even after washing (Figure 1). BET specific surface areas of 94, 75, and 66 m² g⁻¹ were found for CNT_LDPE, CNT_HDPE and CNT_PP, respectively, and a slight increase of 1-5 m² g⁻¹ was observed after washing the materials with acid.

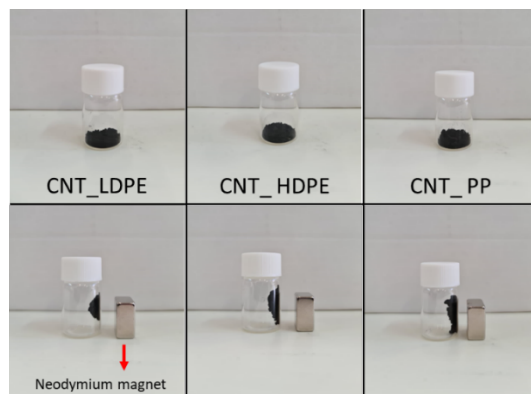


Figure 1. Magnetism interaction of the CNTs.

References

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