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Metal organic framework-derived Fe/carbon porous composite with low Fe content for lightweight and highly efficient electromagnetic wave absorber

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ABSTRACT

Nanoporous carbon decorated with Fe nanoparticles (Fe/C) was prepared via in situ carbonization of Fe precursor-encapsulated Zn-based metal organic framework (ZIF8). In the synthetic process, iron precursor (ferric salt) was mechanically mixed with pre-synthesized ZIF8 taking advantage of the porous characteristic of ZIF8, and then converted to Fe nanoparticles (NPs) at high temperature. The Fe NPs with low content and small size were uniformly embedded in porous graphitic carbon matrix. When the filler loading of Fe/C composite is as low as 15 wt% in paraffin matrix, the absorber exhibited a minimum reflection loss of −29.5 dB at a thickness of 2.5 mm. The strong absorbing capability together with the lightweight feature is closely associated with the well-designed constituent and structure of the composite, which result in good impedance matching and strong electromagnetic energy loss due to the dual-loss mechanism and the synergistic effect between Fe NPs and