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Tunable complex permeability and enhanced microwave absorption properties of $BaNi_xCo_{1-x}TiFe_{10}O_{19}$

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Abstract: In order to achieve a broader absorption bandwidth with smaller reflection loss (RL) in electromagnetic absorber, nickel ions (Ni^{2+}) were employed to partially occupy the sites of cobalt ions (Co^{2+}) in $BaCoTiFe_{10}O_{19}$. Ni-doped barium hexaferrite ($BaNi_xCo_{1-x}TiFe_{10}O_{19}$) powders were synthesized via the sol-gel combustion method. Subsequently, the microwave absorbing composites were prepared by mixing the $BaNi_xCo_{1-x}TiFe_{10}O_{19}$ powders with the paraffin. As the doped Ni^{2+} ions were in augment, the grain size of $BaNi_xCo_{1-x}TiFe_{10}O_{19}$ decreased from 400 nm to 50 nm. Based on the electromagnetic parameters measured by the vector net-analyzer in the frequency of 0.5-18 GHz, it was found that the peaks of the complex permeability shifted to the high frequency region with the increase of the doped Ni. Moreover, the composite (x=0.4) possessed a maximum reflection loss (RL) of -47.49 dB at 13.28 GHz with a matching thickness of 2.0 mm. It also had a bandwidth below -20 dB ranging from 12.36 GHz to 18 GHz, which has great potentials applications in the