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# Tunable complex permeability and enhanced microwave absorption properties of $\text{BaNi}_x\text{Co}_{1-x}\text{TiFe}_{10}\text{O}_{19}$

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**Abstract:** In order to achieve a broader absorption bandwidth with smaller reflection loss (RL) in electromagnetic absorber, nickel ions ( $\text{Ni}^{2+}$ ) were employed to partially occupy the sites of cobalt ions ( $\text{Co}^{2+}$ ) in  $\text{BaCoTiFe}_{10}\text{O}_{19}$ . Ni-doped barium hexaferrite ( $\text{BaNi}_x\text{Co}_{1-x}\text{TiFe}_{10}\text{O}_{19}$ ) powders were synthesized via the sol-gel combustion method. Subsequently, the microwave absorbing composites were prepared by mixing the  $\text{BaNi}_x\text{Co}_{1-x}\text{TiFe}_{10}\text{O}_{19}$  powders with the paraffin. As the doped  $\text{Ni}^{2+}$  ions were in augment, the grain size of  $\text{BaNi}_x\text{Co}_{1-x}\text{TiFe}_{10}\text{O}_{19}$  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

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