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Phosphoric acid addition effect on the microstructure and magnetic properties of
iron-based soft magnetic composites

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Abstract

The phosphoric acid addition effect on phosphate insulation coating microstructure was investigated in this study. The relationships between the phosphate insulation coating microstructure and temperature resistance, corrosion resistance and magnetic properties of iron-based soft magnetic composites (SMCs) were studied by using SEM, TEM/EDS and FTIR. It was observed that an iron phosphate/carbonyl iron core/shell structure is formed with carbonyl iron powder after phosphatizing treatment. The iron phosphate phase was identified as amorphous and its thickness increased from 30 nm to 60 nm as the phosphoric acid concentration was increased from 1wt% to 2wt%. When the phosphoric acid concentration was further increased to 5wt%, the excess iron phosphate precipitates between the soft magnetic composite particles. The temperature and corrosion resistance and resistivity of the iron-based SMCs can be effectively improved using carbonyl iron powders after phosphatizing. The initial

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