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Fabrication of polyimide composite film with both magnetic and surface conductive properties

Jiayu Zhan[a,b], Dezhen Wu[b], Cuixian Chen[a], Jiding Li[a,*], Fusheng Pan[a], Jian Chen[a], Xia Zhan[a]

[a]*Department of Chemical Engineering, Membrane Technology & Engineering Research Center, Tsinghua University, Beijing 100084, P.R. China*
Tel. +86-10-62782432; Fax: +86-10-62770403; email: lijiding@mail.tsinghua.edu.cn
[b]*State Key Laboratory of Chemical Resource Engineering, Beijing University of Chemical Technology, Beijing 100029, P.R. China*

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ABSTRACT

Bilayer polyimide film with superparamagnetic response and conductive surface has been exploited as an important candidate for electromagnetic interference shielding material. Polyimide matrix was derived from 4,4′-oxydianiline and 3,3′,4,4′-benzophenonetetracarboxylic dianhydride. Iron (III) 2,4-pentanedionate (Fe(acac)$_3$) and (1,1,1-trifluoro-2,4-pentadionato) silver(I) (AgTFA) were chosen as magnetic nanoparticles precursor and silver source, respectively. At magnetic polyimide layer, in situ method allowed the Fe(acac)$_3$ to decompose to γ-Fe_2O_3, exhibiting typical superparamagnetic response. The conductive surface-silvered polyimide layer was prepared via in situ single-stage self-metallization technique by thermal curing of the AgTFA-contained poly(amic acid). The reduction of silver(I) and further aggregation of silver atoms gave the conductive polyimide surface. The surface square resistance for the bilayer film of 0.1 Ω/square could be obtained. The structure and the properties of final bilayer film were characterized by X-ray diffraction, scanning and transmission electron microscope, magnetic and conductive measurements.

Keywords: Polyimide; Bilayer; Film; Conductive; Superparamagnetic; In situ method

*Corresponding author.

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