고내열 유연 전자파 노이즈 흡수 필름

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Poly(amide imide)(PAI)-Soft Magnetic Composite Film Coated with poly(3,4-ethylenedioxythiophene)(PEDOT) for Heat Resistant Electromagnetic(EM) Noise Absorber

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1. Introduction

Electromagnetic interference(EMI) shielding researches were usually focused on the use of standard metals and their composites, which have disadvantages due to limited physical flexibility, heavy weight, corrosion, and limited application under various temperatures [1]. So EM noise absorber may be enhanced by increasing thermal stability and conductivity, which is controlled by dielectric constants of electrically conducting polymers or blending heat resistant polymers with soft magnetic materials..

In this study, we report electromagnetic properties to achieve PAI-soft magnetic composite film coated with PEDOT having both effect of extraordinarily high temperature stability and high electrical conductivity and EMI shielding for the aim of electromagnetic noise absorbers in quasi-microwave frequency of GHz range.

2. Experimental

Poly(3,4-ethylenedioxythiophene)(PEDOT) thin films with high electrical conductivity were prepared by repeated chemical polymerization of EDOT(3,4-ethylenedioxythiophene) on glass substrate. Monomer solution was prepared by dissolving EDOT and poly(vinyl pyrrolidone)(PVP) as a binder in 1-butanol. The oxidant solution was prepared by dissolving ferric p-toluensulfonate(FTS) in 1-butanol. The mixed solution of monomer and oxidant solutions were cast into glass substrate and EDOT was polymerized by leaving the glass in a convection oven at 70℃ for 30 minutes. The poly(amide amic acid) were dissolved in organic solvent such as DMAc or DMF separately to give 25% solution. Composite solutions are prepared by adding the mixture of soft magnetic powder from various ratio in poly(amide amic acid) solution and stirring for 1hr using ultra sonification. After this period, poly(amide amic acid) - soft magnet composite solutions were cast with various thickness into PEDOT film using casting applicator device. Thermal

imidization of poly(amide amic acid) was carried out at 100℃, 150℃, 200℃ for 1hr each, followed by complete imidization at 250℃ for 1hr.

3. Results and discussions

The TGA profiles of various films such as PAI film, PEDOT film, PAI-soft magnetic composite film and PAI-soft magnetic film coated with PEDOT film are shown in Figure 1.

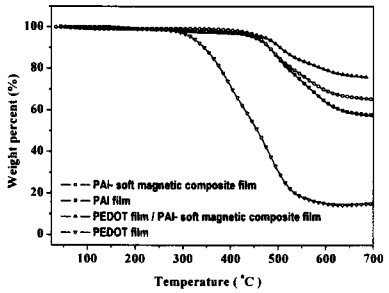
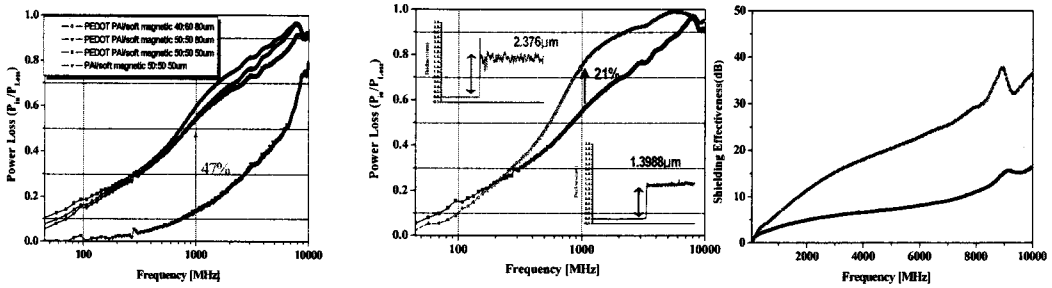


Figure 1. TGA thermograms of various films.

Figure 2 shows that the value of power loss coated with PEDOT composite film was higher than PAI - soft magnet composite film. Also, we confirmed that the EM noise absorber affected by thickness of PEDOT and total composite film and mixing ratio of composite.



(a) (b) (c)

Figure 2. (a) Influence of film thickness and composite ratio on power loss (b) Influence of PEDOT thickness(soft magnetic = 50%, film thickness = 80μm) on power loss and (c) shielding effectiveness.

4. Conclusions

We developed a new technique of fabricating a EM noise absorber film by blending a soft magnet powder with PAI on the polymerized PEDOT. We could obtain approximately 75% power loss at 1GHz by controlling composite ratio and PEDOT film thickness and total film thickness.

5. Reference

[1] J. Joo and A. J. Epstein. *Appl. Phys. Lett.*, 65, 18, (1994).