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Research Progress of Organic polymer Composite Materials Modified by Carbon Nanotube

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ABSTRACT: Carbon nanotube is a kind of the special structure of material. Its radial length is nano-level and axial length is micron order of magnitude. Both ends of this one-dimensional quantum tube are basically sealed. Several dozens of layers of coaxial pipe is made up of the hexagonal arrangement of carbon atoms. In this paper, the Organic polymer Composite Materials Modified by Carbon Nanotube is introduced, it contains composite materials based ester, composite materials based resin matrix, composite materials based rubber and composite materials based alkeny. Ultimatelythe prospects for the applications of carbon nanotubes were proposed.

Keywords. carbon nanotube; composite materials; resin matrix.

I. INTRODUCTION

Currently, most domestic desalting process based on ion-exchange. The multi-media filter usually was used into pretreatment, post-processing system gives priority to mixed beds or rehabilitation beds. The drawbacks of this desalination water technology and which caused environmental problems are caused for concern by domestic and foreign scholars. Membrane technology is the most potential separation technology in the 21st century, but it rare in reports of the membrane integrated applications in the industrial. This paper introduced salt desalination processes of a chemical factory and a set of integrated membrane desalination water treatment processes. Carbon nanotubes is a kind of the special structure of material, it is a kind of one-dimensional nano-material with light weight and hexagon structure, it is a kind of hollow pipe, Carbon nanotubes contains Single Wall Carbon Nanotubes (SwCNTs) and Multi Wal1 Carbon Nanotubes (MWCNTs) according to the layer number of carbon atomic. Carbon nanotubes has many good performance in mechanics, electricity and chemic, the length of Carbon nanotubes is from micron to millimeter level, the diameter of Carbon nanotubes is from few nanometers to several decade nanometers, so, the aspect ratio of Carbon nanotubes is big, this performance is important to many composite materials[1].

Many researchers devote themselves to the research of Carbon nanotubes, because of the special structure and good performances of Carbon nanotubes, the application prospect of Carbon nanotubes is obvious, many researchers have compounded the Carbon nanotubes and polymer in order to produce composite materials with better performances. In this paper, the Organic polymer Composite Materials Modified by Carbon Nanotube is introduced, it contains composite materials based ester, composite materials based resin matrix, composite materials based rubber and composite materials based alkeny. Ultimatelythe prospects for the applications of carbon nanotubes were proposed.

II. RESEARCH OF ORGANIC POLYMER COMPOSITE MATERIALS MODIFIED BY CARBON NANOTUBE

A. composite materials based ester modified by Carbon nanotube

A researcher named Guiying Yu [2] has prepared polyurethane/ Carbon nanotube composite materials, the researcher do some research about the effect of the content of Carbon nanotube for the friction property of composite materials. The result shows that the friction coefficient will go down if the content of Carbon nanotube increased; the effect of time for the riction property of composite materials is little; Carbon nanotube can reduce the friction coefficient of the composite materials and improve the friction property of polyurethane. A research named Junliang Lv[3] has prepared Carbon nanotubes/ polyurethane composite materials. The researcher do some research about the effect of the content of Carbon nanotubes for electric property, the result shows that the content of Carbon nanotubes reached 1.0%, the composite materials can be used as antistatic material; The dispersibility of Carbon nanotubes is uniform, the strength and elasticity are improved. A researcher named Yingchun Jiao [4] has prepared the polymethylmethacrylate/ Carbon nanotubes composite materials with the method named in-situ composite method, melt blending complex legal method and legal solution blending method, Carbon nanotubes has improved the property of polymethylmethacrylate.

B. composite materials based resin matrix modified by Carbon nanotube

A researcher named Gang Liu [5] has prepared SWCNT/ epoxy resin composite materials, the researcher do some research about the electromagnetic shielding performance. The result shows that the electromagnetic shielding performance improved with the thickness of SWCNT, the thickness of SWCNT is limited, so researches solve the problem through multilayer attacking. A researcher named Zhaochen Chen[6]has prepared epoxy resin composite materials, the researcher test the absorbing property of epoxy resin composite materials and do some research about the effect of the content of Carbon nanotubes for absorbing property. The result shows that the absorbing property improved first and then went down, when the content of Carbon nanotubes is 12%, the biggest absorbing property is -18. 4dB. A researcher named Lin Liu[7] has prepared many Carbon nanotubes composite materials, the result shows that the Carbon nanotubes can improve the property of composite materials, when the content of Carbon nanotubes is 0.5%, the strength of the composite increase 60%-120%, the hardness of composite materials will increase with the increasing content of Carbon nanotutes.. A researcher named Youan Lei [8] has prepared many Carbon nanotubes composite materials. The researcher does some research about the electronic property, hot endowment property and adhesive property. The result shows that the content of Carbon nanotubes is 2%, the comprehensive property achieve the best.

C. composite materials based rubber modified by Carbon nanotube

Wu Ning et al [9] prepare MC/NR composite materials, the results shows that coupling agent react with the MC increase interaction between MC and rubber matrix and improve the dispersion of MC in composite materials, and makes composite materials more excellent physical properties and electrical conductivity. When the dosage of MC is higher, the modified composite material not only show the excellent physical properties, but also has good conductive heat conduction performance, which can solve the problem of rubber tire shoulder raw thermal damage, etc. But on current industrial scale is small, and carbon nanotubes use-cost is high, Carbon black and carbon nanotube compound preparation prepare a new tyre products has more practical significance with practical significance in the future. Li Guoxi[10] et al prepare the modified MWNTs/acrylate rubber (ACM) composite materials, study the dosage of modified MWNTs effect on the properties of composite materials, with the increase of dosage of modified MWNTs, as a result of the modified MWNTs can exert its effect of nanoparticles, exert its reinforcement, wear-resisting, heat-resistant, and many other performance advantages, so the composite material of conventional mechanical properties, oil resistance, abrasion resistance, heat-resistant ageing performance and thermal decomposition temperature gradually increased, E ' (storage modulus) showed a trend of increase, tg (transition temperature) is gradually reduced. When the dosage of MWNTs is 7.5% elongation at break is maximum. When the dosage of MWNTs is 10.0% tanδ(loss factor) minimum. Wang Nianqing[11] et al prepared multi-walled carbon nanotubes (MWNTs)/carbon black/butadiene rubber (BR) composite material, studies its electrical conductivity and physical properties. The results show that MWNTs can better improve BR's electrical property, Because MWNTs and carbon black aggregates form the conductive network of the composite material, so improving the electrical conductivity of the composite materials. When the dosage of carbon black is 40 copies, join 1 to MWNTs can make the volume resistivity of the composite material from Ω 1.2 x 1010 cm decrease to 7.0 x 105 Ω · cm, When the dosage ratio of MWNTs/carbon black is 5/40, MWNTs and carbon black in the BR synergistic reinforcement effect is obvious, composite material Shao Er type A hardness, tensile strength, tensile elongation and tearing strength improved significantly.

D. composite materials based alkeny modified by Carbon nanotube

Zhang ling[12] and others using the method of covalent bond modification made polypropylene (PP)/ β - NA - MWCNTs composite material, the modified agent for aromatic dicarboxylic acid amides β nucleating agent (β- NA), the substance can induce polypropylene to produce large amounts of β crystal, thus can improve the crystallinity of the composite material, at the same time, the electrical conductivity of composite material compared to carbon nano material and polypropylene improves the 3 and 11 orders of magnitude respectively, improved the electrical properties of the composite material significantly. Sun Guoxing[13] et al using composite polymer compound, solution and melt composite methods prepare polystyrene and carbon nanotubes into polystyrene/carbon nanotubes composites (PS/CNT). composite polymer compound is let carbon nanotubes dispersed in styrene monomer or its solution, make monomer polymerization to get, The way of solution composite is under the condition of solution let carbon nanotubes evenly dispersed in the polystyrene, then composite solvent casting or spin coating, finally remove solvent by volatile method, Molten compound method is under the influence of shear force, makes carbon nanotubes dispersed in the polystyrene, the process must be conducted above polystyrene plastic flow temperature. By research scholars also found polystyrene/carbon

nanotube composite material elastic modulus and tensile strength are increased, and its electrical properties and thermal properties are improved, and the composite material can be used as a lubricant directly.

III. . CNTS COMPOSITE MATERIAL PERFORMANCE ENHANCEMENTS

Carbon nanotubes as enhancement can effectively improve the physical properties and mechanical properties of composite materials, make materials optimal performance, polymer has advantages of easy molding, low price and good performance. Therefore composite materials are widely used in national defense, architecture, medical, communications and other fields, with the expanding the application fields, higher request is put forward about the performance of the composite material, research scholar has been working on composite materials performance enhancements.

Yu Haitao[14] et al studied carbon nanotubes dispersed in the polymer and the combined effect, conduct chemical modification on the surface of the carbon nanotubes, the main analysis methods have morphology observation analysis, spectral analysis and the analysis of the grafted rate. The main processing methods are pure gas processing, sedimentary organic film and graft modification. In order to make the material can better exert its performance, researchers want to increase the dielectric constant of composite materials, add high dielectric constant of ceramics powder is a frequently-used method, and this will inevitably affect the flexibility of composite materials, so choose high dielectric constants of complexes has become another new research direction. Research scholars such as Wang Lan[15] studied multi-walled carbon nanotube before and after the modification polymer matrix composites of dielectric properties. As the basic material properties, mechanical strength and toughness is the focus of scholars attention and study.

Dong Jinhu[16] and other research scholars try a lot to improve the material strength and toughness, used materials are organic small molecules, elastomer, rigid particles, fibers, carbon nanotubes, for further study on the modification of polymer provides a lot of reference.

IV. CONCLUSION

Carbon nanotubes preparation and properties of polymer-based composites research has made great progress, But its still exist some shortcomings, embodied in people lack of sufficient evidence about interaction between the components of polymer matrix composites and the influence mechanism, description is not very clear, and in terms of polymer-based composite dielectric materials, the correlation research on electricity and magnetism of material is imperfect, technology index in the process of application and the mechanism of method research is not thorough, still need further studies[17].The surface energy of carbon nanotubes is high, in order to evenly dispersed in composite material is a very difficult thing, and on the orientation of carbon nanotubes, it is difficult to achieve material weighted requirements, all these problems need to be solved[18]. So in the future, we should focus on studies of new process method, make carbon nanotubes and polymer to form the good interface bonding, and the new technology can make carbon nanotubes can be evenly dispersed in the polymer and composite materials all aspects of performance are enhanced.

REFERENCES

[1] Qianghua Wang. The Carbon nanotubes in the composite materials[J]. Glass fiber reinforced plastics, 2010, 1: 39-45.
[2] Guiying Yu, Xiaobing Li. The friction performance of polyurethane/ Carbon nanotubes composite materials[J]. Lubrication and seal, 2012, 37(2):54-57.
[3] Junliang Lv, Yi Liu, Yunhong Yi. Polyurethane composite materials modified by Carbon nanotubes[J]. Synthetic resin and plastics, 2011, 28(3):24-26.
[4] Yingchun Jiao, Tongde Shen, Qin Liang. Research development in Carbon nanotubes-reinforced PMMA composites[J]. China plastics, 2012, 26(10):16-23.
[5] Gang Liu, Wenjun Ma, Fuefeng An. The shielding properties of Carbon nanotubes/ epoxy resin composite materials[J]. New carbon materials, 2012, 27(2): 100–104.
[6] Yaochen Chen, Zhenyu Feng, Qianyi Yang. The absorbing property of Carbon nanotubes/ epoxy resin composite materials[J]. The journal of function materials and devices, 2011, 17(3):258-261.
[7] Lin Liu, Jing Song, Ziping Ye. Effect of modified Carbon nanotubes on mechanical properties of boron phenolic resin-based composite materials[J]. Journal of building materials, 2011, 14(5):610-614.
[8] Youan Lei. Research of the property of Carbon/epoxy composite materials[J]. Chemic in Guangzhou, 2012, 40(9):61-63.
[9] Ning Wu, Zhenhua Wang, Liqun Zhang. The preparation, structure and properties of multi-walled carbon nanotubes/NR composite materials[J]. Rubber industry, 2011, 58(11):645-652.
[10] Guoxi Li, Jianqing Zhou, Runxia Wang. The research of preparation and performance about Carbon nanotubes/acrylate rubber composite materials[J]. Carbon technology, 2011, 30(5):6-9.

[11] Qingnian Wang, Li Chen, Li Wang. The research of Multi-walled carbon nanotubes/carbon black/butadiene rubber conductive composite materials[J]. Rubber industry, 2012, 59(5):270-275.
[12] Ling Zhang, Bin Hu, Chunzhong Li. Dispersion and crystallization behavior of polypropylene nancomposites with β nucleating agent modified multiwall carbon nanotubes[J]. Acta polymerica sinica, 2011, 12:1374-1380.
[13] Guoxing Sun, Guangming Chen, Zhengping Liu. The reviewed of Polystyrene/carbon nanotubes composite materials[J]. Polymer bulletin, 2009, 2:12-20.
[14] Haiyao Yu, Yu Liu, Wencai Wang. The review of plasma surface functionalization of carbon nanotubes and polymer matrix composite materials[J]. Plastics, 2012,41（4）：109-113.
[15] Lan Wang, Zhimin Wang. Carbon nanotubes filled polymer-based dielectric composites with high dielectric constant[J]. Transactions of China electro technical society, 2006, 21(4):24-28.
[16] Jinhu Dong. Reinforcement and toughening of polymer matrix composites[J]. China plastics, 2012,26(7):20-27.
[17] [Guangsen He, Tao Zhao, Pengli Zhu. Research progress of polymer matrix composite dielectric materials[J]. Journal of material, 2011,25（12）：85-91.
[18] Hongyan Li. The research of the preparation of carbon nanotubes/polymer composite materials [J]. Teaching of forestry region, 2010, 8:121-123.