Study on Preparation and Property of PAN-based Activated Carbon Fiber Felt

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Abstract: The manufacture craft and equipment of PAN-based activated carbon fiber felt were studied, and the adsorption property of PAN-ACF by iodine value and benzene value and produced PAN-ACF with excellent adsorption property were tested. Through tests, we got some numerical values under perfect craft situation: the specific surface area of activated carbon fiber felt is 1 686 m^2/g, the hole dimension is 0.55 mL/g and the average aperture is 0.65 nm.

Key words: PAN-based activated; carbon fiber felt; carbonization; study
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Activated carbon fiber (ACF) is the third generation of new functional adsorption material since 1970s developed after powdery and granulated activated carbon. Because the fiber diameter is between 10 ~ 30 μm, the specific surface area is big, there are a lot of micropores and the distribution of micropore is narrow and is apt to contact with sorption material, the diffusion resistance is small, therefore the sorption speed is very fast and is beneficial to the separation of sorption. We can produce felt, cloth and paper according to the demand and for multitude uses. Thus, the products of ACF are being paid more and more attention in the field of chemical industry, environment protection, radiation defense, electronic industry, medical use and pod hygiene[1-2]. In the paper, we used self-made device, studied the preparation of carbonization and activation of polyacrylonitrile (PAN)-based ACF and tested the properties of the materials.

1 Experiments

We used oxide fiber of polyacrylonitrile (OPANF) as material produced by Jilin carbon fiber factory.

2 Results and discussion[3-5]

2.1 Relationship Between the Iodine Adsorption Value and the Activated Temperature

From Fig.1, we can see, with the hoist of temperature, within certain extend, the iodine adsorption value increased, but when the value increased to a certain degree, the increasing began to slow down, this is because with the hoist of temperature, the specific surface area increased gradually, which enhanced the adsorption performance of ACF, but after increased to a certain degree, the specific surface began to slow down, this is because the exorbitant temperature made the reaction conduct too acutely, which caused the micropore destroyed, so that the specific surface began to slow down, so the activated temperature is not the higher, the better.

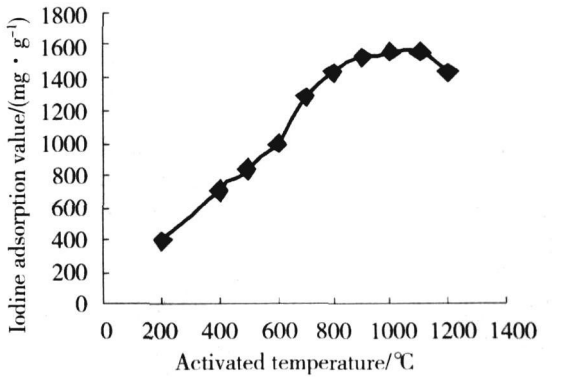

Fig.1 Relationship between iodine adsorption value and activated temperature

2.2 Relationship Between the Iodine Adsorption Value and the Activated Time

From Fig.2, we can see, the longer the activated time, the better the adsorption of ACF, the lower the yield coefficient. This is because with the prolong of activated time, the activator and the carbon atom con-

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duct the chemical reaction constantly while some by-products produced during the reaction liberated constantly leaving empty holes on fiber surface. With the prolong of activated time, the reaction developed in depth, the holes' position became deeper and deeper, bigger and bigger, therefore, the adsorption became better and better.

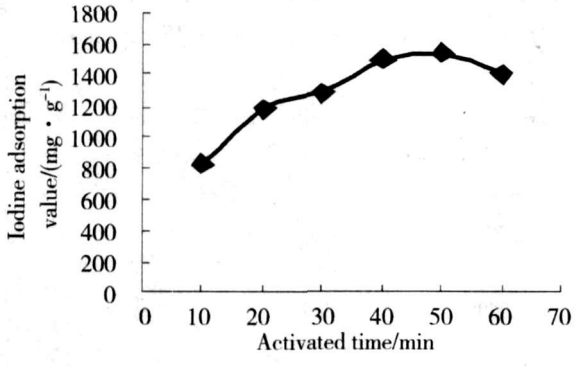

Fig. 2 Relationship between iodine adsorption value and activated time.

2.3 Relationship Between the Iodine Adsorption Value and the Activated Concentration

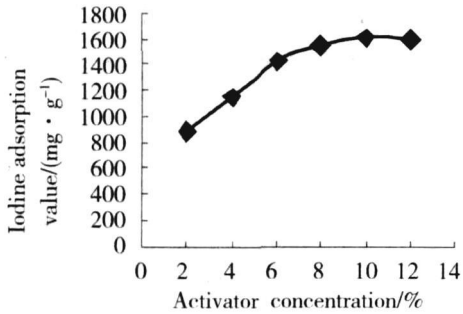

Fig. 3 Relationship between iodine adsorption value and activator concentration.

From Fig. 3, we can see, with the increasing of activator concentration, the iodine adsorption value increased, while when increased to a certain degree, the iodine adsorption value fall. This is because, with the increasing of activator concentration, the reaction velocity increased gradually, which made the surface area of ACF enlarged gradually, so the adsorption ability strengthened. But when the activator concentration increased to a certain degree, the reaction conducted too acutely, which destroyed the micro-pores that had already formed, therefore, the adsorption ability fall.

3 Conclusions

Under such circumstance that other conditions were same, with the increasing of the amount taken up by dipping, the iodine adsorption value increased first, when it reached the maximum, it fall gradually.

Under such circumstance that other conditions were same, with the hoist of temperature, the iodine adsorption value and the benzene adsorption value all increased first, when it reached the maximum, it fall and the yield coefficient fall gradually.

Under such circumstance that other conditions were same, with the prolong of activated time, the iodine adsorption value and the benzene adsorption value all increased first, when it reached the maximum, it fall and the yield coefficient fall gradually.

The surface area of PAN-ACF manufactured by better technology was 1 686 $m^2 \cdot g^{-1}$, the volume of pore was 0.55 mL/g, the average inside diameters was 0.65 nm.

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聚丙烯腈基活性碳纤维毡的制备及性能研究

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摘　要：研究了聚丙烯腈基活性碳纤维毡的制备及实验装置的研究，并用碘吸附值和苯吸附值对聚丙烯腈基活性碳纤维的性能进行了测试，并得出了实验的最佳工艺，通过对最佳工艺制得的活性碳纤维的比表面积、孔容和孔径的测试。我们得出以下结论：比表面积为 1 686 m^2/g，孔容为 0.55 mL/g，孔径为 0.65 nm。

关键词：PAN-ACF；碳化；研究
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静电纺氧化铝纳米纤维研究

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摘　要：采用溶胶－凝胶法，以聚乙烯醇、硝酸铝、水为原料配制出了硝酸铝/聚乙烯醇溶胶－凝胶纺丝液，并通过静电纺丝技术纺制了 $Al(NO_3)_3$/PVA有机－无机杂化纤维，经高温锻烧后得到了平均直径约为 50～250 nm无机纳米氧化铝纤维。

关键词：静电纺丝；氧化铝；纳米纤维；煅烧
中图分类号：TQ343.5