

小片径氧化石墨烯

产品说明



专注研发，只为更高品质

一、产品概述

1. 昂星新碳开发的小片径氧化石墨烯 (Small-size Graphene Oxide) 简称SGO。
2. SGO系列产品均含有丰富的含氧官能团，可溶于水、NMP、DMF、乙二醇等溶剂，同时在乙醇、THF等溶剂中有较好的分散性能。
3. SGO系列产品具有纯度高、分散性好、片径尺寸小等优点，可广泛应用于催化材料领域，作为负载纳米金属、氧化物等催化剂的载体。也可用于纤维领域，增强增韧纤维。SGO系列可应用于润滑领域，通过接枝改性能够降低摩擦系数。

二、产品参数

产品编号	SGO 1311	SGO 1321	SGO 1411	SGO 1421
形态	粉体	浆料	粉体	浆料
颜色	棕黄色	棕黄色	棕黄色	棕黄色
厚度 (nm)	~1	~1	~1	~1
单层片径 (μm)	0.1~2	0.1~2	0.05~1	0.05~1
可剥离率 (%)	>98	>98	>98	>98
碳含量 (wt.%)	~42.4	~42.4	~42.3	~42.3
氧含量 (wt.%)	~46.87	~46.87	~47.42	~47.42
硫含量 (wt.%)	<2.1	<2.1	<1.9	<1.9
灰分 (wt.%)	<1.0	<1.0	<1.0	<1.0
振实密度 (g/L)	~300	—	~300	—
颗粒度 (mesh)	< 80	—	< 80	—
浓度 (mg/ml)	—	~10 可定制	—	~10 可定制

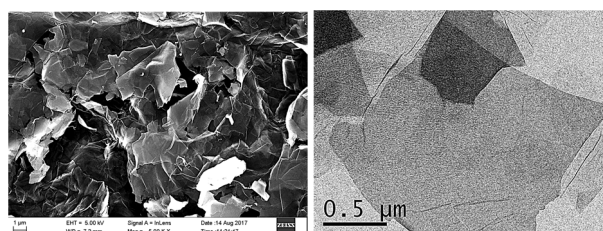


图1. 昂星SGO产品SEM和TEM图谱

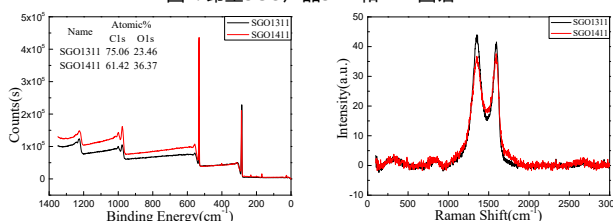


图2. 昂星SGO产品XPS分析和Raman分析

三、产品性质说明

1. 分散性能：SGO系列产品在水中分散性良好，在NMP、乙醇、DMF、THF等极性溶剂中有一定分散能力，添加少量水可以显著提高其分散性。
2. 含水量：SGO系列产品具有很强的亲水性能，SGO中的水包括自由水、吸附水和层间结合水，而在通常的干燥过程中会有部分层间结合水保留在SGO中。实验表明适量的结合水能确保SGO比较优秀的剥离分散性能，本产品中也含有一定量的层间结合水。
3. pH测试：采用Hummers法等化学氧化法制备SGO系列产品过程中，需要对强酸性的浆液进行多次洗涤，但在上层滤液接近中性的情况下，SGO分散的溶液依然会呈酸性，这是由于氧化石墨烯本身含有-COOH结构。详见以下溶液的酸度测试表格。

浓度 (mg/ml)	pH值	浓度 (mg/ml)	pH值
0.1	4.58	3.0	3.13
0.5	3.83	5.0	2.83
1.0	3.56	10.0	2.57
2.0	3.34		

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四、应用情景举例

发泡材料

SGO因为尺寸小、分散性能优异、比表面积大、强度高、片状结构以及易接枝改性等特点，对改善聚合物发泡材料性能具有尤为显著的作用。在聚合物发泡过程中，可以作为异相成核剂起到增加成核点、限制泡孔增长、减少泡孔尺寸等作用，从而改善材料的机械、力学和绝热阻燃等性能。

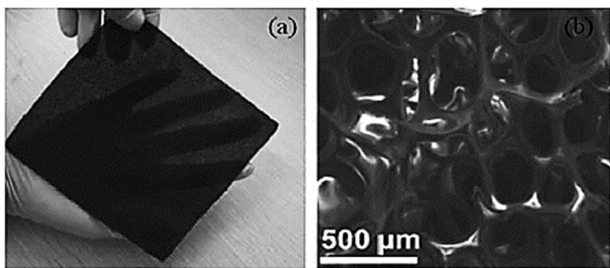


图3. 氧化石墨烯应用于发泡材料

五、保存技术

粉体和气凝胶：室温下密闭保存（ $< 30^{\circ}\text{C}$ ），保存时请勿与金属、维生素C、 NaHSO_3 、 NaBH_4 等还原性试剂接触。开封后请低温密闭保存，并尽量于3-6个月内使用完毕。

浆料和分散液：低温下阴凉处密封保存（ $< 20^{\circ}\text{C}$ ），保存时请勿与金属、维生素C、 NaHSO_3 、 NaBH_4 等还原性试剂接触。产品开封后应低温密闭保存（不可结冰，结冰亦会对层间水产生影响），并尽量在3-12个月内使用完毕（若满足上述保存条件，保质期可达3年）。

六、品质检测

为了让客户获得最佳品质的SGO系列产品，昂星新碳建立了严格的出厂检验机制，确保在售产品均处于最佳性能状态。

七、注意事项

使用安全：在高温下SGO粉体产品容易发生热解式爆炸，而且对粉体的研磨、撞击等加工也可能产生爆炸反应，请务必做好相关条件下的安全防护。粉体对人体的肺及呼吸道有害，使用过程中请做好相应的粉尘防护。浆料有一定酸性，使用时请避免与皮肤直接接触。

贮存运输：粉体包装瓶为PS材质，浆料包装瓶为PP材质，请远离热源，请勿与有机溶剂接触。溶剂型浆料包装瓶为PE材质，请远离热源。

本说明书为简要产品说明，具体产品说明请登录公司网站 www.ashinecarbon.com 查看及下载。

如果对上述内容存在任何疑问或需要相关文献，欢迎联系我们：Sales@ashinecarbon.com

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Small-size Graphene Oxide

Product Information



ASHINE
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I. Product Overview

1. Small-size Graphene Oxide developed by Ashine is called SGO for short.
2. SGO has abundant oxygen-containing functional group and it can dissolve in many solvents, such as H₂O, NMP, DMF, EG and etc.. Moreover, SGO also shows good dispersibility in ethanol, THF and other solvents.
3. SGO series, with the advantages of high purity, good dispersibility and small size, can be widely applied in catalytic material field as the carrier of catalysts such as nanometer metal and oxidizing materials, as well as applied in fiber field to enhance reinforcement fibers. SGO series can also be applied in lubricating field to reduce frictional coefficient after grafting modification.

II. Product Parameters

Product Number	SGO 1311	SGO 1321	SGO 1411	SGO 1421
Form	Powder	Slurry	Powder	Slurry
Color	Brownish yellow	Brownish yellow	Brownish yellow	Brownish yellow
Thickness (nm)	~1	~1	~1	~1
Monolayer diameter (μm)	0.1~2	0.1~2	0.05~1	0.05~1
Exfoliation rate (%)	>98	>98	>98	>98
Carbon content (wt.%)	~42.4	~42.4	~42.3	~42.3
Oxygen content (wt.%)	~46.87	~46.87	~47.42	~47.42
Sulfur content (wt.%)	<2.1	<2.1	<1.9	<1.9
Ash content (wt.%)	< 1.0	< 1.0	< 1.0	< 1.0
Tap density (g/L)	~300	—	~300	—
Grain size (mesh)	< 80	—	< 80	—
Concentration (mg/ml)	—	~10 Customizable	—	~10 Customizable

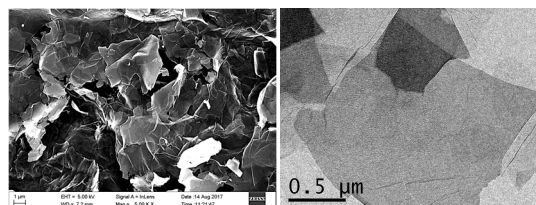


Fig. 1. SEM and TEM Images of Ashine SGO Products

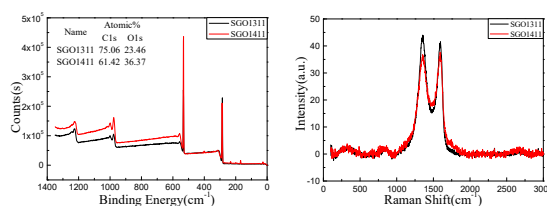


Fig. 2. XPS and Raman Analysis of Ashine SGO Products

Concentration (mg/ml)	pH value	Concentration (mg/ml)	pH value
0.1	4.58	3.0	3.13
0.5	3.83	5.0	2.83
1.0	3.56	10.0	2.57
2.0	3.34		

III. Description of Product Properties

1. **Dispersibility:** SGO series have good dispersibility in water and have certain dispersibility in polarity solvents such as NMP, ethyl alcohol, DMF and THF. Its dispersibility can be greatly improved by adding a small amount of water.
2. **Water content:** SGO series have strong hydrophilic performance. Water in SGO includes free water, absorption water and interlayer bound water, while some interlayer bound water is usually retained in SGO after drying process. Test shows that, proper bound water can ensure excellent stripping and dispersy of SGO. Thus, a certain amount of interlayer bound water is also contained in the product.

Properties of the above mentioned products are for reference only, and shall not be regarded as shipment commitment or acceptance criteria of the Company. All data provided above is general information we have learned as far. Due to new and wide application of the product, some even beyond our control, we will not bear any responsibilities in case we have not considered all necessary information in actual application. The Company reserves the right to improve product parameters as well as the final right of interpretation.

Small-size Graphene Oxide

Product Information



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3. pH test: with chemical oxidization such as Hummers method adopted in the process of preparing SGO series products, highly acidic slurry is required to be washed for several times. However, in the case of super-filtrate close to neutralization, solution dispersed by SGO is still acid due to $-COOH$ structure contained in graphene oxide itself. See the above solution acidity test table for details.

IV. Application Example

Foam material

SGO can significantly improve the performance of polymer foam material due to its small size, excellent dispersibility, large surface area, high strength, sheet structure and easy to graft modification. In the process of polymer foaming, SGO can act as heterogeneous nuclei in adding nucleating points, limiting foam increasing, and reducing foam size, thus to improve mechanical, physical, heat insulation and flame retardant properties of the material.

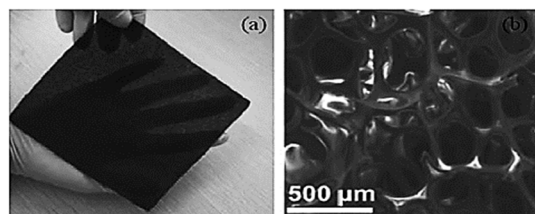


Fig. 3. Graphene Oxide Applied in Foam Material

V. Preservation Technology

Powder and aerogel: Keep it airtight at room temperature (less than 30 °C). Keep it away from reductive reagents such as metals, vitamin C, $NaHSO_3$ or $NaBH_4$ when it is stored. Please store it at low temperature after unsealing and it should be used up within 3-6 months.

Slurry and aqueous dispersion: Keep it in a cool place at a low temperature (less than 20 °C). Keep it away from reductive reagents such as metals, vitamin C, $NaHSO_3$ or $NaBH_4$ when it is stored. The product should be stored at a low temperature after unsealing (freezing is not allowed otherwise the interlayer water will be affected), and it should be used up within 3-12 months (if the above storage conditions are satisfied, the shelf life can be 3 years).

VI. Quality Inspection

In order to provide customers with SGO series products of the best quality, Ashine has established a strict factory inspection mechanism to ensure that its products on sale give the best performance.

VII. Notice

Safe use: At a high temperature, SGO powder products are prone to pyrolysis explosion, and such processes as powder grinding and impacting may also cause an explosive reaction. Please ensure safety protection under the relevant conditions. The powder is harmful to the lungs and respiratory tract of the human body, so please ensure corresponding dust protection when being used. The slurry has a certain acidity, so please avoid direct contact with the skin when being used.

Storage and transportation: Powder packaging bottle for PS materials, slurry packaging bottle for PP materials. Please keep away from heat sources and organic solvents.

This manual is a brief product description. Please visit the company's website at www.ashinecarbon.com to view and download a detailed product description. If you have any questions about the above or require the relevant literature, please contact us at Sales@ashinecarbon.com.

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