

低缺陷氧化石墨烯

产品说明



专注研发，只为更高品质

一、产品概述

1. 昂星新碳开发的低缺陷氧化石墨烯 (Low Defects Graphene Oxide) 简称LDGO。
2. LDGO系列产品均具有缺陷低、易修复、纯度高等优点，可广泛应用于导电/导热材料、复合材料、化学还原石墨烯材料等领域，适合科研院所等研发单位及企业使用。
3. 在相同HI还原条件下，LDGO系列产品的还原产物是常规GO系列产品还原产物的电导率的5倍，所以LDGO是化学法制备高导电石墨烯材料的首选。

二、产品参数

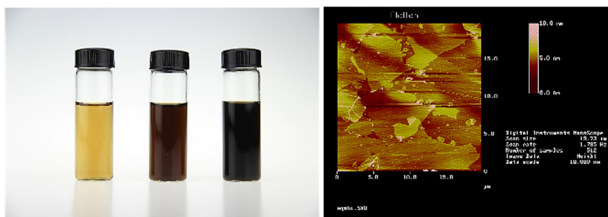


图1. 昂星LDGO分散液和AFM图谱

产品编号	LDGO 2211	LDGO 2221	LDGO 2231
形态	粉体	浆料	分散液
颜色	棕绿色	棕黄色	棕黄色
厚度 (nm)	~1	~1	~1
单层片径 (μm)	0.5~20	0.5~20	0.5~20
可剥离率/单层率 (%)	>95	>95	>95
碳含量 (wt.%)	~44.5	~44.5	~44.5
氧含量 (wt.%)	~48.9	~48.9	~48.9
硫含量 (wt.%)	<1.5	<1.5	<1.5
灰分 (wt.%)	<1.0	<1.0	<1.0
振实密度 (g/L)	270	—	—
颗粒度 (mesh)	<80	—	—
浓度 (mg/ml)	—	10~20 可定制	0.5~5 可定制

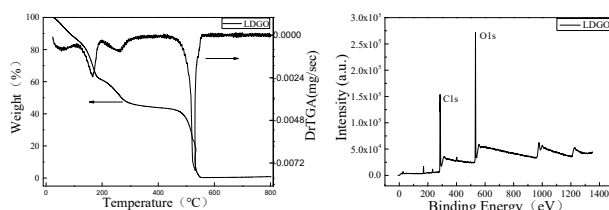


图2. 昂星LDGO产品TGA和XPS分析图谱

三、产品性质说明

1. 导电性能：由于LDGO系列产品的特殊结构，使用其浆料制备的LDGO薄膜经过HI还原后 (LDrGO)，缺陷得到充分修复，电导率为40000~60000 S/m，高于同条件下还原的常规GO薄膜 (rGO) (7000~10000 S/m)。
2. 导热性能：采用LDGO浆料涂覆成膜，并经HI室温还原后，缺陷得到充分修复，其面内热扩散系数可达648 mm²/S，导热率可达700W(m·k)⁻¹以上。
3. 流变性能：对浓度为10mg/ml的LDGO浆料进行流变性能测试，结果显示LDGO浆料呈剪切变稀，且有着较好的时间稳定性。此浆料可根据客户要求浓度调节后，直接使用。

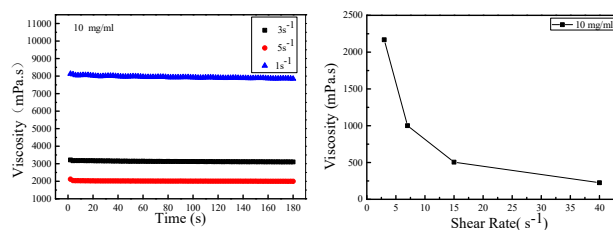


图3. 昂星LDGO浆料流变性能分析

4. pH测试：由于LDGO系列产品含有-COOH等结构，所以分散溶液偏酸性。

浓度 (mg/ml)	pH值	浓度 (mg/ml)	pH值
0.1	3.57	3.0	2.26
0.5	3.03	5.0	2.12
1.0	2.73	10.0	1.60
2.0	2.37		

以上产品之物性仅供参考，不作为本公司出货承诺书或验收准则。以上所提供的数据仅为一般通用信息，为目前我方所了解的资料。因该产品适用及应用范围新而广，有些甚至超出我方掌控，因此，即使我方没有考察到实际应用中的全部必要信息，我方也不负任何责任。本公司保留改善产品参数之权利，最终解释权归本公司所有。

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四、应用情景举例

石墨烯薄膜

将LDGO粉体均匀分散，形成一定浓度的LDGO浆料，经昂星特殊工艺处理后，采用抽滤、气液界面组装、层层自组装、LB膜、气泡模板法、涂布法、流延法等，可以获得厚度从纳米到微米的LDGO薄膜材料。该LDGO薄膜具有优异的力学性能和离子渗透分离能力，可应用于海水淡化等领域。将该LDGO薄膜进行化学还原、电化学还原等，即可获得具有柔韧性的高导电石墨烯薄膜。



图4. 昂星LDGO系列产品制备石墨烯薄膜

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。开封后请于低温密闭保存，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LDGO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LDGO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。

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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Low Defects Graphene Oxide

Product Information



FOCUS ON R&D
FOR SUPERIOR QUALITY

I. Product Overview

1. The Low Defects Graphene Oxide developed by Ashine is referred to as 'LDGO' for short.
2. With such advantages as low defect rate, easy to restore and high purity, LDGO series products can be widely used in electric/thermal conductive materials, composite materials, chemical reduced graphene materials and other fields, making them suitable for research institutes and other R&D units and enterprises.
3. Under the same HI reduction conditions, the conductivity of the reduced products of LDGO series products is 5 times as high as that of the conventional GO series products. As such, LDGO is the first choice for the preparation of graphene material with high conductivity through chemical methods.

II. Product Parameters

Product Number	LDGO 2211	LDGO 2221	LDGO 2231
Form	Powder	Slurry	Dispersion
Color	Brownish green	Brownish yellow	Brownish yellow
Thickness (nm)	~1	~1	~1
Monolayer diameter (μm)	0.5~20	0.5~20	0.5~20
Exfoliation rate (%)	>95	>95	>95
Carbon content (wt.%)	~44.5	~44.5	~44.5
Oxygen content (wt.%)	~48.9	~48.9	~48.9
Sulfur content (wt.%)	<1.5	<1.5	<1.5
Ash content (wt.%)	< 1.0	< 1.0	< 1.0
Tap density (g/L)	270	—	—
Grain size (mesh)	< 80	—	—
Concentration (mg/ml)	—	10~20 (Customizable)	0.5~5 (Customizable)

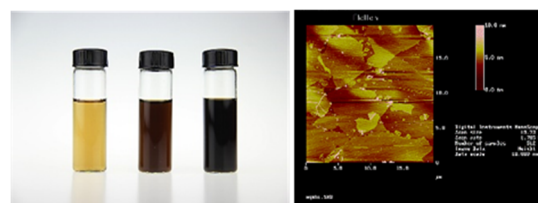


Fig. 1. Dispersion of LDGO and AFM Images

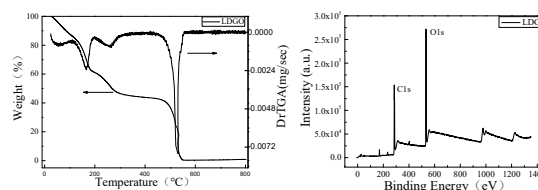


Fig. 2. Ashine LDGO Products TGA and XPS Analysis

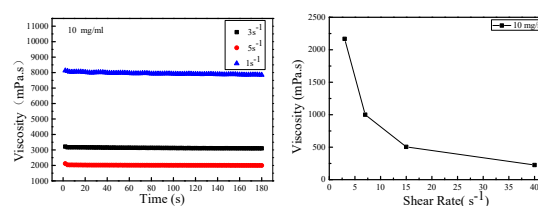


Fig. 3. Ashine LDGO Slurry Rheological Property Analysis

III. Description of Product Properties

1. **Electric conductivity:** Because of the special structure of LDGO series products, the defects of LDGO film are fully repaired after the HI reduction and its conductivity is 40,000~60,000 S/m, higher than that of conventional GO film (rGO) (7,000 - 10,000 S/m) under the same conditions.
2. **Thermal conductivity:** LDGO film was prepared from LDGO slurry by coating method, and its defects were fully restored by HI at room temperature. The surface thermal diffusion coefficient of which is up to 648 mm²/S and its thermal conductivity can reach more than 700 W (m·k)⁻¹
3. **Rheological properties:** The rheological properties of LDGO slurry of 10 mg/ml concentration was tested. The results indicate that LDGO slurry shows shear thinning property and good time stability. The slurry can be adjusted and used directly according to the customers' requirements.
4. **pH test:** LDGO series products contain -COOH and other structures, so their solutions are partially acidic.

Concentration (mg/ml)	pH value	Concentration (mg/ml)	pH value
0.1	3.57	3.0	2.26
0.5	3.03	5.0	2.12
1.0	2.73	10.0	1.60
2.0	2.37		

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.

Low Defects Graphene Oxide

Product Information



IV. Application Example

Graphene films

LDGO powder is dispersed to form LDGO slurry with a certain concentration. After the special processing of Ashine, LDGO films with a thickness from nanometers to micrometers can be obtained by such methods as filtration, gas-liquid interfacial assembly, layer-by-layer assembly, LB film, bubble template method, coating method and tape casting. LDGO films have excellent mechanical properties and ion permeation and separation ability, and can be applied in desalination and other fields. Graphene films with high conductivity and flexibility can be obtained through the chemical and electrochemical reduction of LDGO films.

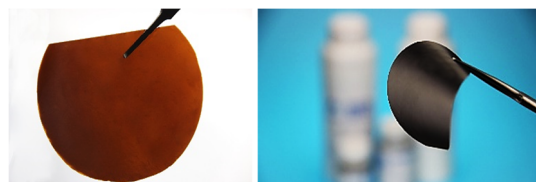


Fig. 4. Graphene Film Prepared from Ashine LDGO Series Products

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, NaHSO₃ or NaBH₄ 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, NaHSO₃ or NaBH₄ 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 LDGO 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, LDGO 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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