



学汇百川 德济四海

科研绘图经验分享

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导师：潘新祥教授 徐敏义教授

2022年4月1日



目录 ontents



大连海事大学
DALIAN MARITIME UNIVERSITY

「01」 论文图片绘制

「02」 汇报PPT绘制

「03」 总结与心得



如何选择合适的字体

1. 选用 sans serif (无衬线) 字体

- 首选：Arial，Helvetica，微软雅黑
- Adobe：Myriad
- Apple：San Francisco

2. 字号要小

- 5pt — 7pt

3. 尽量不添加颜色

4. 尽量不加斜体

5. 数量-单位/运算符之间加空格

- $10\mu\text{W} \rightarrow 10 \mu\text{W}$



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nature > for authors > final submission

For Authors

- Editorial criteria and processes
- Formatting guide
- Pre-submission enquiries
- Initial submission
- Final submission
- Supplementary information
- Forms and declarations
- Matters Arising
- Other types of submissions
- Publishing options

Final submission

This guide provides information on preparing production-quality figures and text files. The instructions apply only if your manuscript has been accepted in principle for publication and an editor has asked you to upload production-quality material.

General information

Before your manuscript can be formally accepted for publication and passed to our subediting, art and production departments, you will need to upload electronic files of your text, figures, Extended Data figures and tables, and Supplementary Information (if any) to our server. You will also need to upload scanned copies of any forms and declarations requested by the editorial office for signing (these may be faxed if scanning is not possible, with the fax labelled clearly with the corresponding author name and manuscript reference number).

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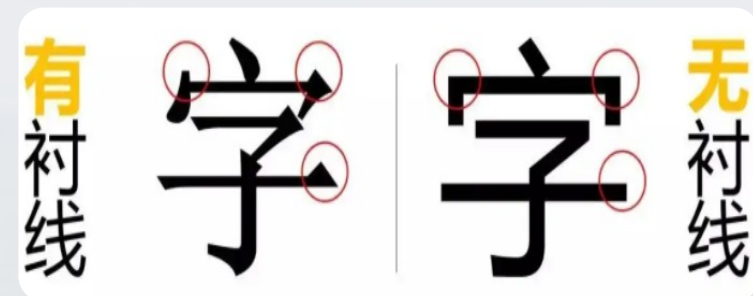
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Lettering should be in a sans-serif typeface, preferably Helvetica or Arial, the same font throughout all figures in the paper. Units, capitalization, etc. should follow *Nature* style. Where practical, avoid placing lettering directly over images or shaded areas.

Separate panels in multi-part figures should each be labelled with 8 pt bold, upright (not italic) a, b, c. Maximum text size for all other text should be 7 pt; minimum text size should be 5 pt. Amino-acid sequences should be presented in one-letter code in Courier.

Do not rasterize or covert text to outlines.



ACS Publications

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Table of contents graphic:

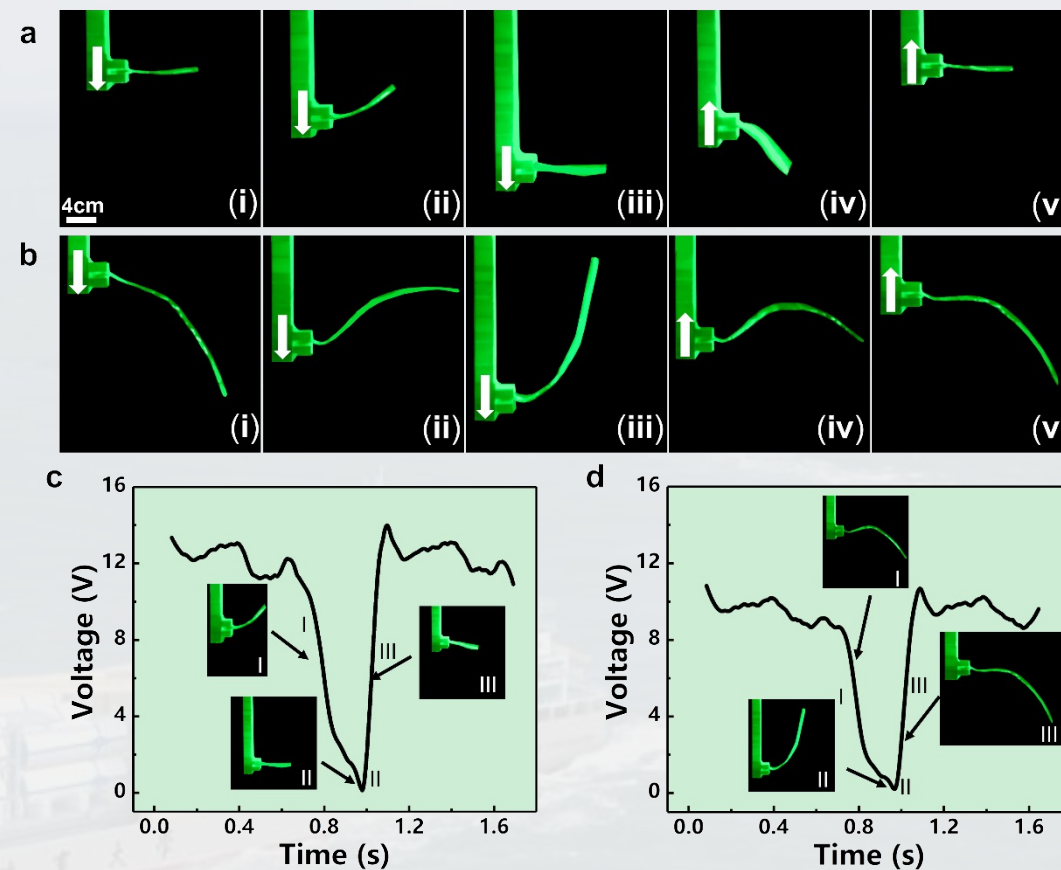
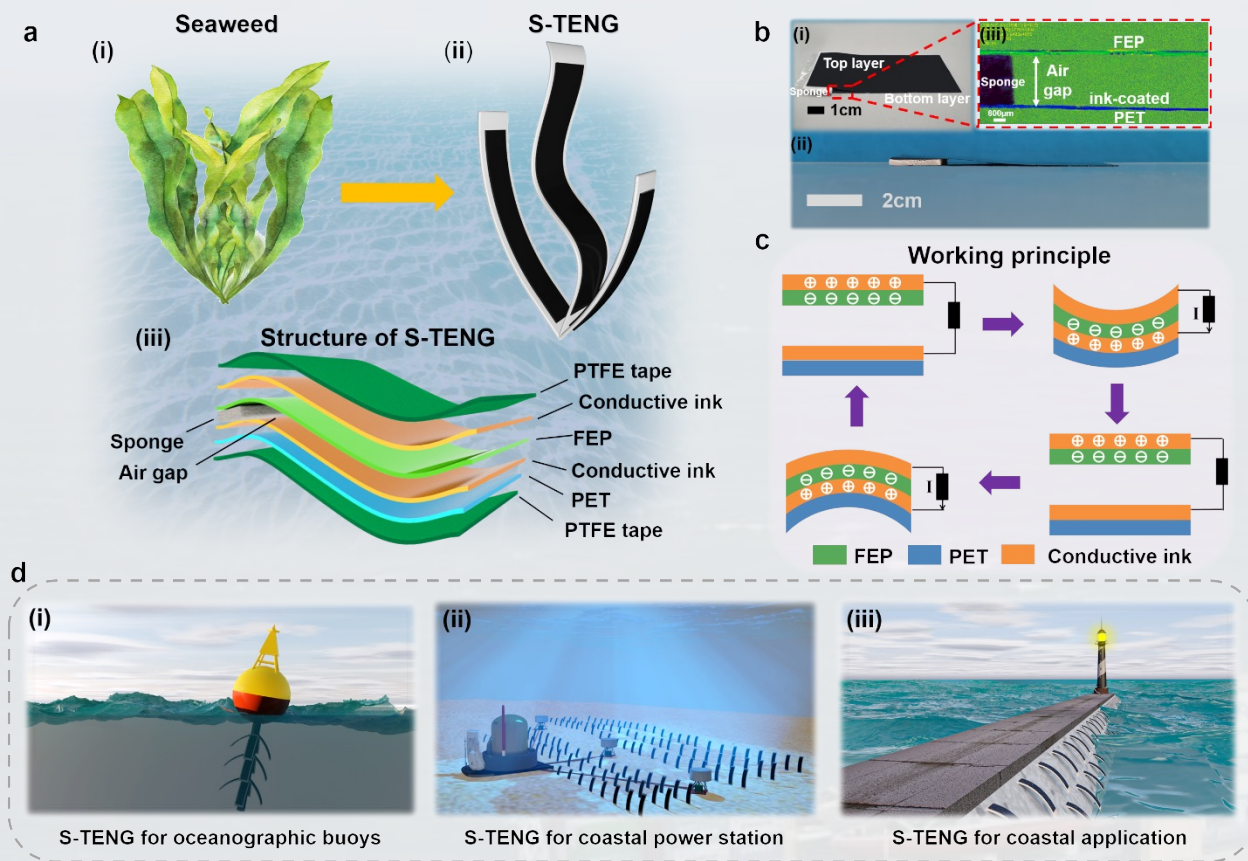
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- ☐ Under no circumstance can a logo be included in the TOC graphic.

Figures and tables:

- ☐ All figures and tables must be cited in order (e.g., Figure 1A).
- ☐ Figures must have captions.
- ☐ Schemes must have titles and may contain footnotes.
- ☐ Structures should be numbered with boldface Arabic numbers.
- ☐ Use Arial for lettering within a graphic. Lettering should be of uniform size and density, points and lines should be no thinner than 0.5 point at final published size.
- ☐ Figures containing photographic images must be at least 300 dpi TIF files in RGB format; should be at least 1200 dpi EPS files.
- ☐ Figures must be submitted at final published size.



如何选择合适的字体



- 1.字体：序号、文字标注始终保持一致（无衬线字体）
- 2.字号：序号、文字标注的字号保持一致，序号 > 标注
- 3.非必要情况，尽量不改变颜色、不使用斜体



论文示意图的绘制

1.模型建立/绘制

- Solidworks/CAD
- Cgmodel.com
- Cg99.com

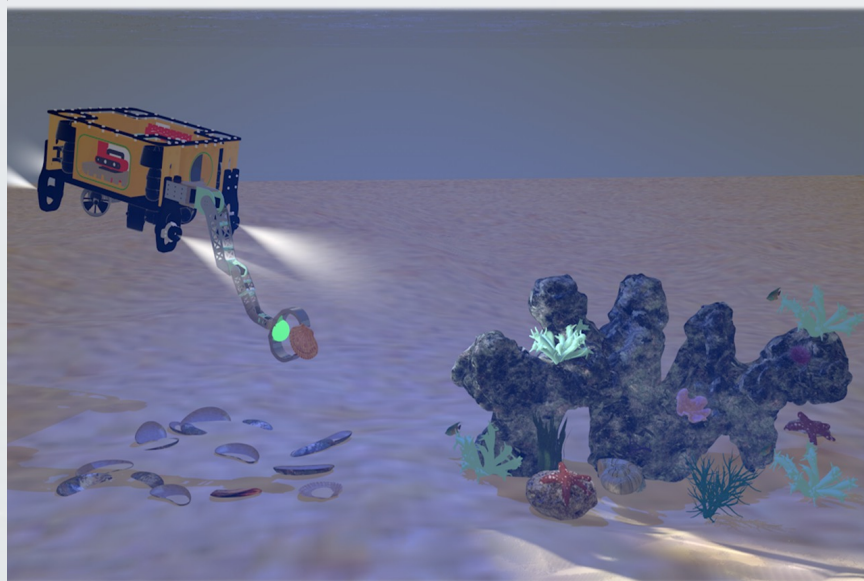
2.软件渲染上色

- Cinema 4D
- 3dmax/Maya
- Keyshot

3.成图后处理

- PS/AI/AE
- 导出Tif/Tiff格式

保持美观 浅显易懂



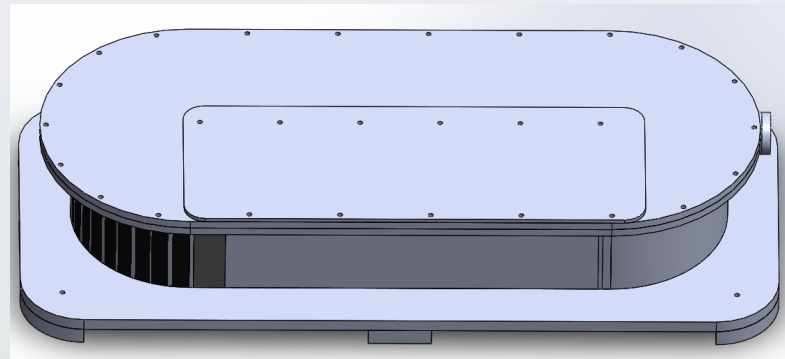
模型元素：ROV、贝壳、珊瑚、礁石



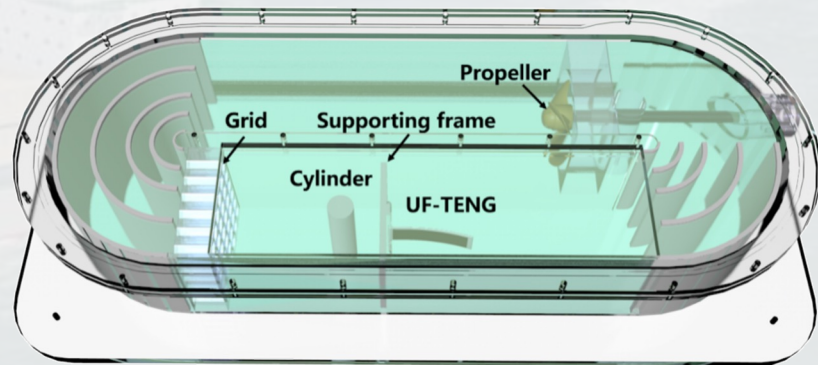
C4D中海底场景、灯光元素的建立



渲染、PS后处理（调亮度、饱和度）



模型元素：循环水槽



材质的选择、渲染、后处理



C4D工作窗口

1.渲染器

- 自带标准渲染器
- Octane渲染器

2.材质球的选择

- 现有材质包
- 自调材质包

3.插件选择

- 海洋插件
- 粒子插件

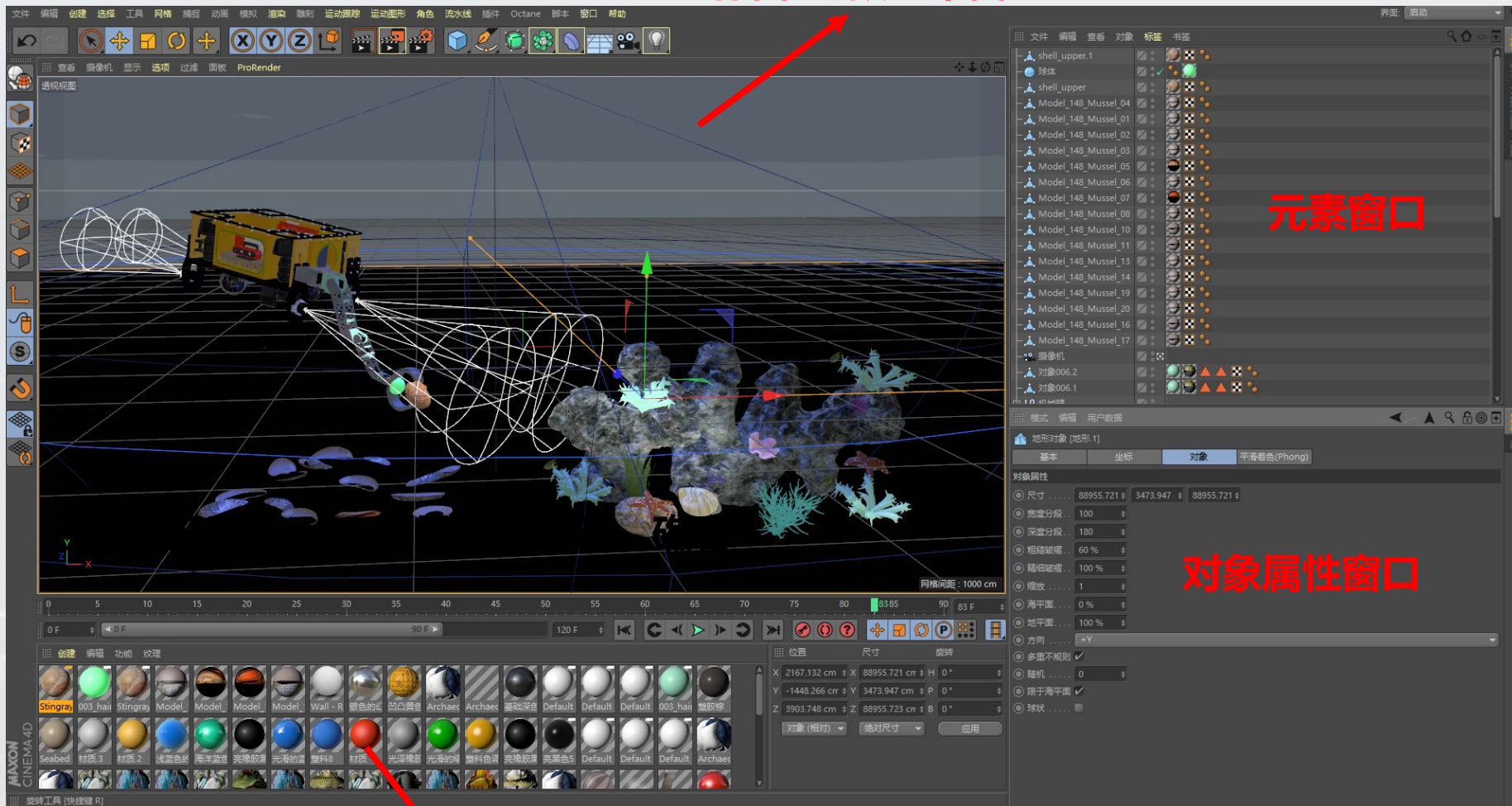
.....

工作窗口/预渲染窗口

元素窗口

对象属性窗口

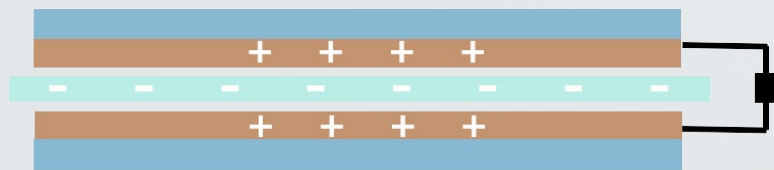
材质球窗口



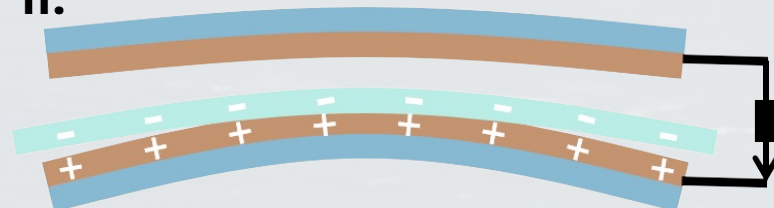


PPT绘制

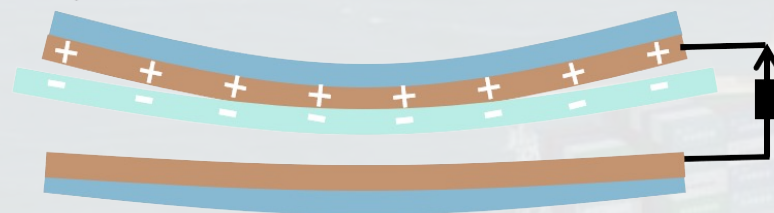
d. i.



ii.



iii.



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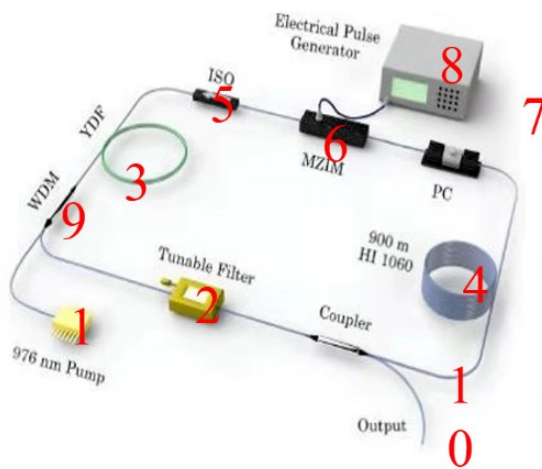
纳米发电机 2022-03-31 17:15

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伊曼如歌

科研人的知识加油站！



【PPT特辑·C60分子结构绘制】

原创 零尘世 零尘世 2020-06-11 11:27

收录于话题

#PPT科研绘图-补位专辑

12个 >

C60是一种结构高度对称的分子，由32个面组成，12个正五边形、20个正六边形，这意味着PPT画出其3D结构可以大概率实现。笔者以前考虑过全3D无死角的画法，但考虑到后期计算量（人脑&PPT）巨大，最后不得不放弃。

简要思路：正六边形+球的基本单元、正五边形+球的基本单元，利用补位手法迅速绘制与这些基本单元对称的结构。两个基本单元的属性要求：尺寸大小一样、旋转中心一样、是运用补位原理构建的组合。

考虑到教程长度，以下内容中基本操作（如设置棱台、距底边高度、调出选择窗口、水平翻转等）均不再详细列出，只给出具体参数。PPT里用到的部分插件，本号后台回复“PPT插件”可以获得相关信息。

正文如下：

①绘制正六边形+球体的基本单元

利用英豪插件“添加正多边形”功能绘制一个正六边形，右键属性锁定纵横比，宽度修改为4 cm，无填充，线条浅灰色、宽度10磅。



形状格式的调整、插件的选择等

自学平台：B站、公众号等

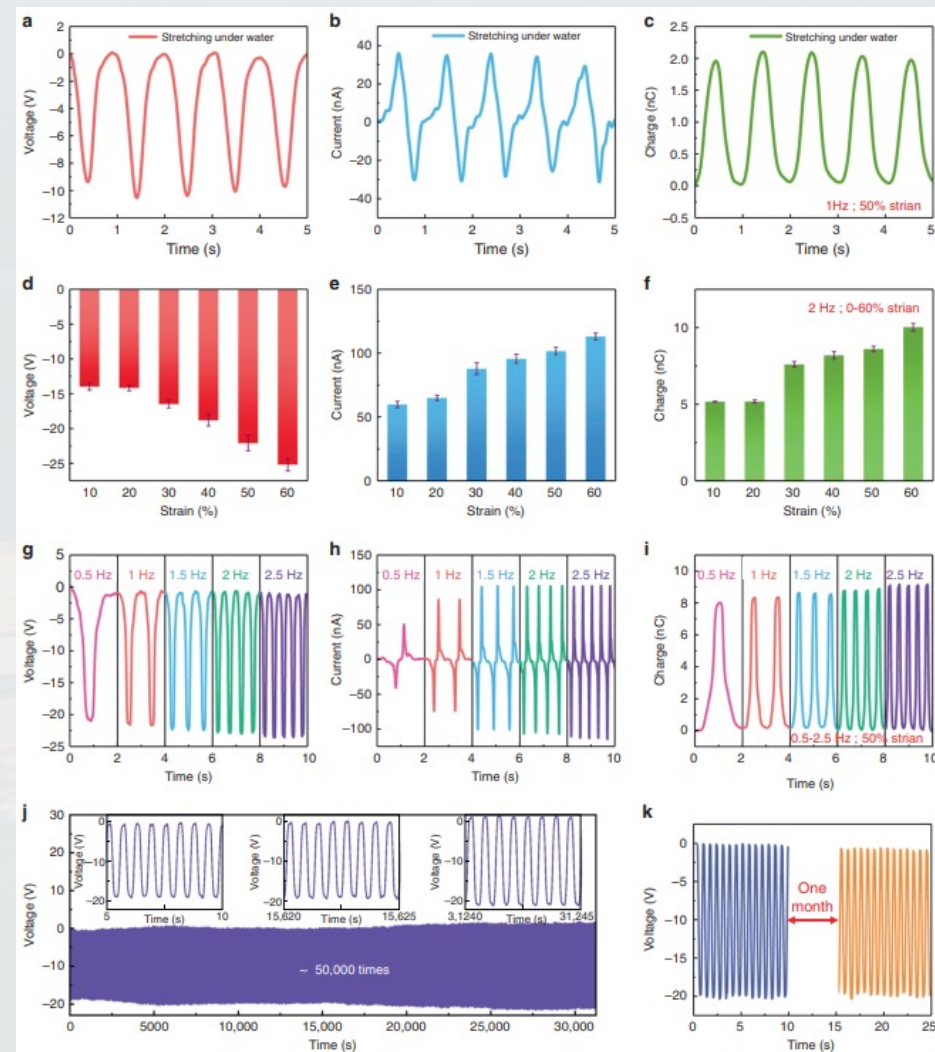
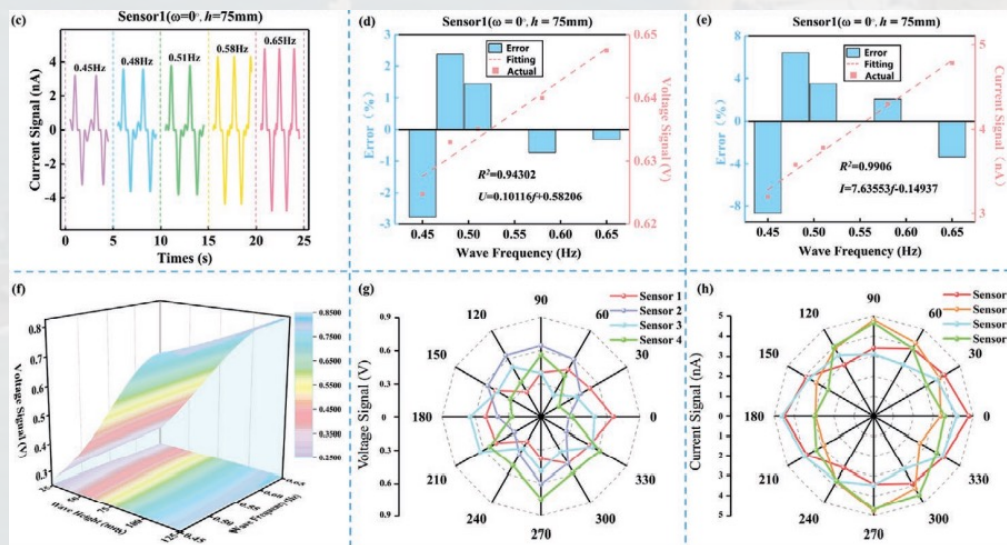


论文数据图的绘制

- Origin作图长宽比一般为**1:1**，便于和其他图片拼合
- 坐标轴的主刻度尺朝内，图片高度3-4 cm, 字号8 pt
- 坐标轴0.5或0.75 pt，曲线线条0.75或1 pt
- 推荐Origin输出Tiff图在PPT中做后期，图片文字大小、线条粗细**保持一致**
- 对多个变量合理使用渐变色，会使逻辑更加清楚
- **多样性**：雷达图、矩阵图、极坐标等

Xinyu Wang et al.,

Adv. Mater. Technol., 2021



Zhou Li et al., *Nature communication*, 2019



论文toc图的制作

Toc : Table of content/Graphical Abstract

Specifications

- The graphic should be in the form of a structure, graph, drawing, photograph, or scheme—or a combination.
- Text should usually be limited to the labeling of compounds, reaction arrows, and diagrams. Long phrases or sentences should be avoided.
- Submit the graphic at the actual size to be used for the TOC so that it will fit in an area no larger than 3.25 inches by 1.75 inches (approx. 8.25 cm by 4.45 cm).
- Use a sans serif font type such as Helvetica, preferably at 8 pt. but no smaller than 6 pt. Do not make the reader strain to read it. The type should be of high quality in order to reproduce well.
- The graphic file should be saved as either:
 - TIFF at 300 dpi for color and at 1200 dpi for black and white.
 - EPS in RGB document color mode with all fonts converted to outlines or embedded in the file.
- Label the graphic "For Table of Contents Only" and provide it on the last page of the submitted manuscript.

ACS NANO

www.acsnano.org

Artificial Intelligence of Things (AIoT) Enabled Floor Monitoring System for Smart Home Applications

Qiongfeng Shi, Zixuan Zhang, Yanqin Yang, Xuechuan Shan, Budiman Salam, and Chengkuo Lee*

Cite This: <https://doi.org/10.1021/acsnano.1c07579>

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ACCESS |

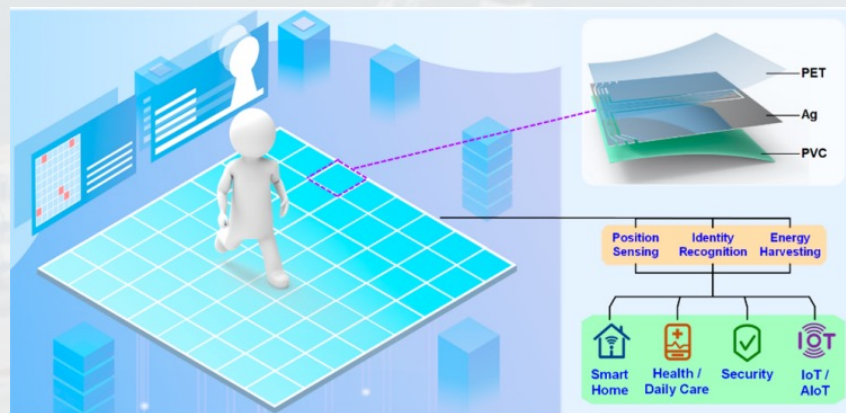
Metrics & More

Article Recommendations

Supporting Information

ABSTRACT: To enable smart homes and relative applications, the floor monitoring system with embedded triboelectric sensors has been proven as an effective paradigm to capture the ample sensory information from our daily activities, without the camera-associated privacy concerns. Yet the inherent limitations of triboelectric sensors such as high susceptibility to humidity and long-term stability remain a great challenge to develop a reliable floor monitoring system. Here we develop a robust and smart floor monitoring system through the synergistic integration of highly reliable triboelectric coding mats and deep-learning-assisted data analytics. Two quaternary coding electrodes are configured, and their outputs are normalized with respect to a reference electrode, leading to highly stable detection that is not affected by the ambient parameters and operation manners. Besides, due to the universal electrode pattern design, all the floor mats can be screen-printed with only one mask, rendering higher facileness and cost-effectiveness. Then a distinctive coding can be implemented to each floor mat through external wiring, which permits the parallel-array connection to minimize the output terminals and system complexity. Further integrating with deep-learning-assisted data analytics, a smart floor monitoring system is realized for various smart home monitoring and interactions, including position/trajectory tracking, identity recognition, and automatic controls. Hence, the developed low-cost, large-area, reliable, and smart floor monitoring system shows a promising advancement of floor sensing technology in smart home applications.

KEYWORDS: floor monitoring, artificial intelligence, deep learning, triboelectric nanogenerator, smart home, coding



宽度不超

4.45cm

长度不超

8.25cm

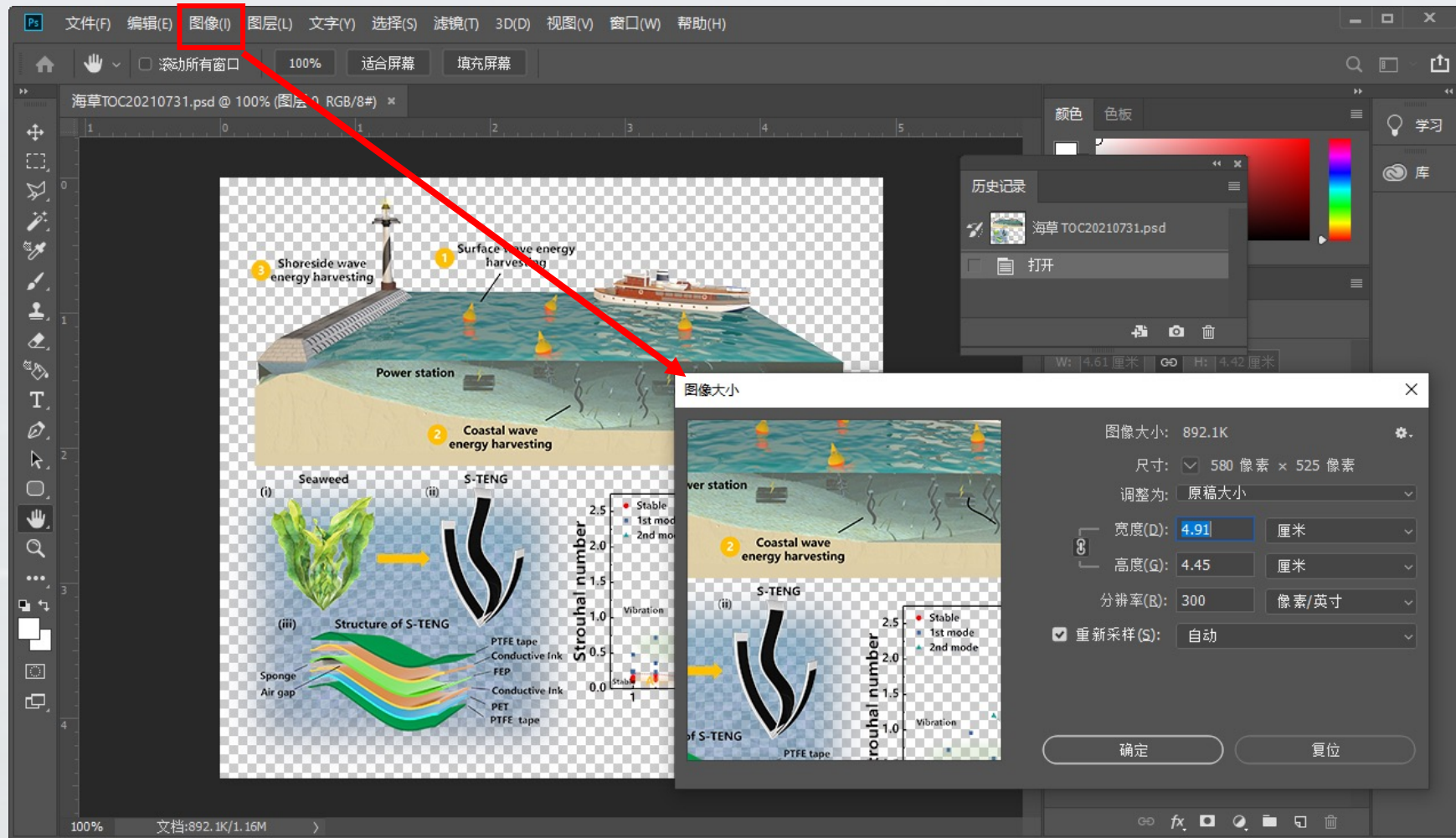
300DPI

Chengkuo Lee et al., *ACS nano*, 2021

保持美观 保证凝练



论文toc图的制作—PS工作窗口



注意：若Toc里有文字说明，请在处理完图片后在PPT上另加文字
否则图像缩小后文字将变得模糊！



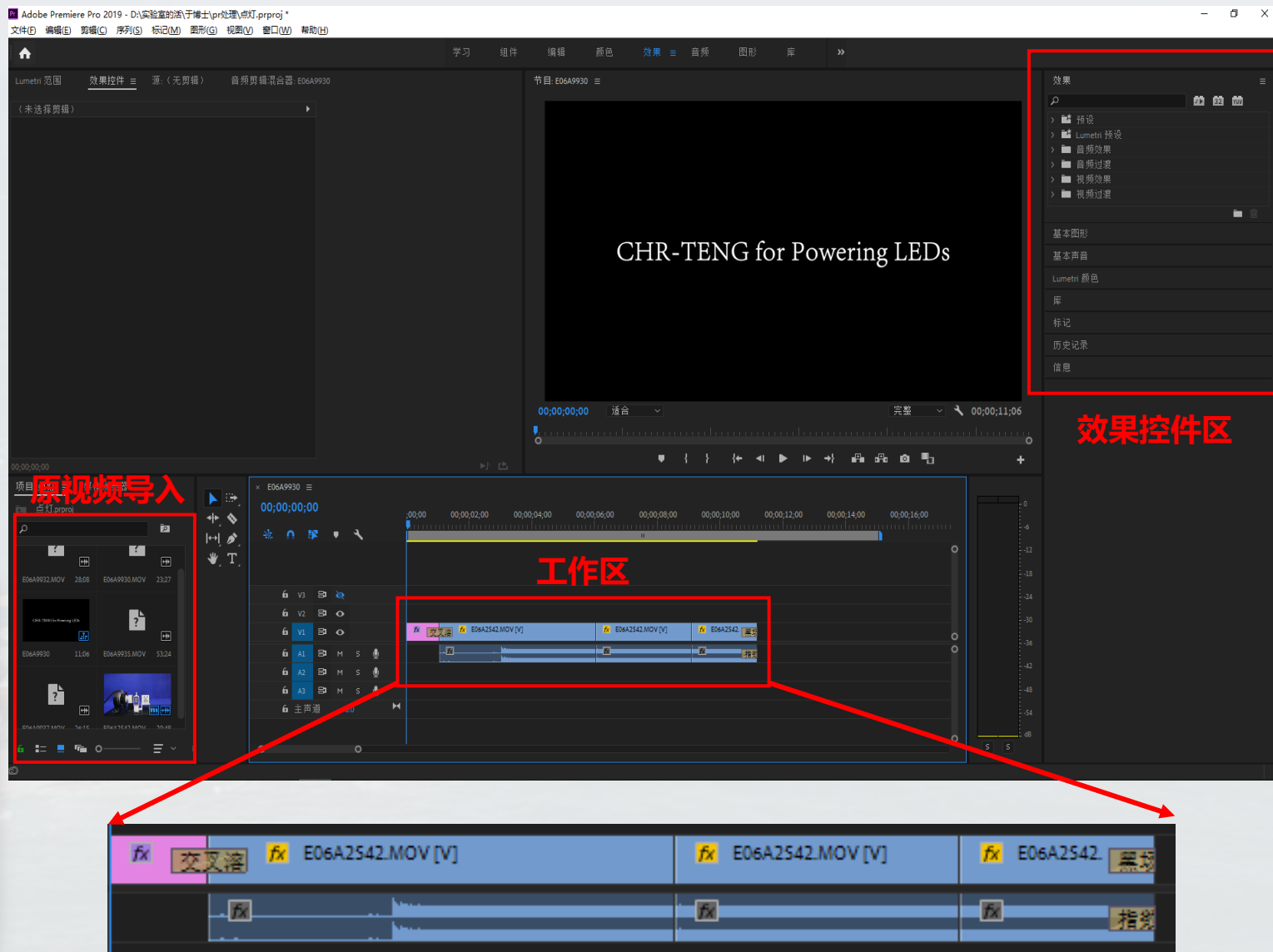
论文demo的制作—Pr工作窗口

CHR-TENG for Powering a Thermometer

Haichao Yuan et al., *Nanomaterials*, 2021

Tips

1. 原视频录制过程中保持无环境杂音
2. 保持录制设备的固定/稳定运镜
3. 导出**中等比特率**，文件大小20M以内
4. Pr2021兼容苹果手机拍照视频



效果控件区

工作区

插入字幕、关键帧、转场等元素效果



论文大图的绘制

1

科研论文配图的演变

2

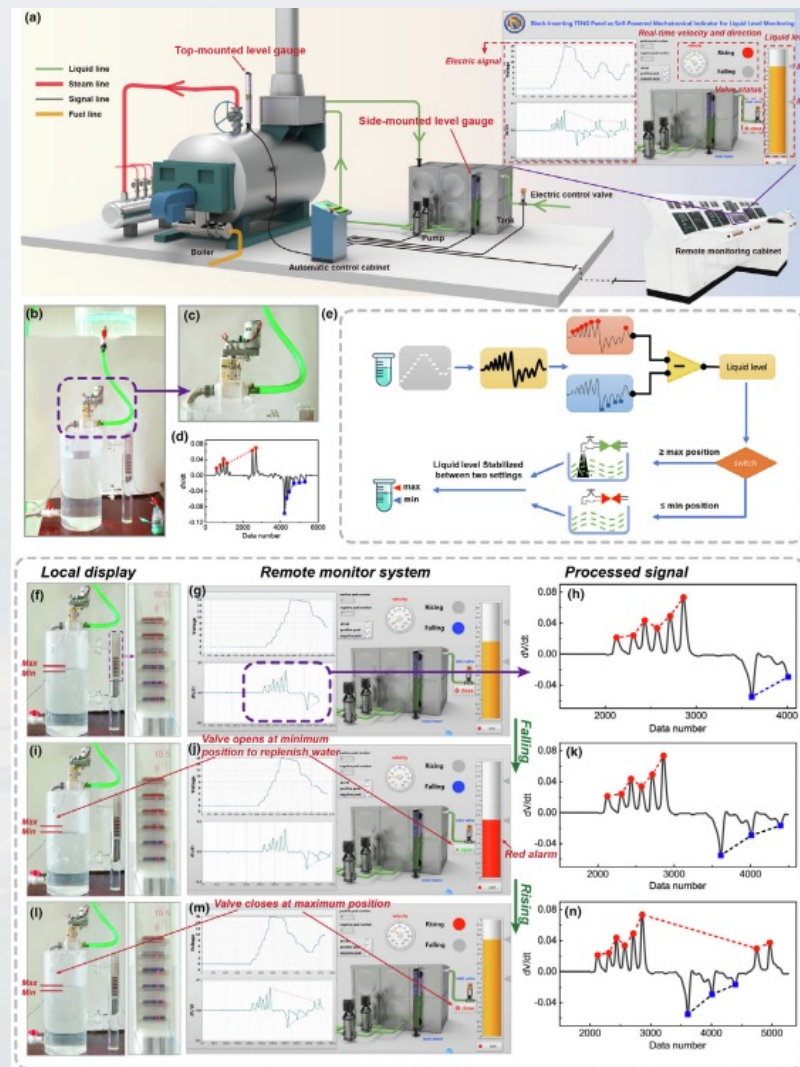
科研论文配图的建议

3

常用色彩搭配网址

4

大图的构思与排版



Minyi Xu* et al., *Materials Today*, 2021



科研论文配图的建议

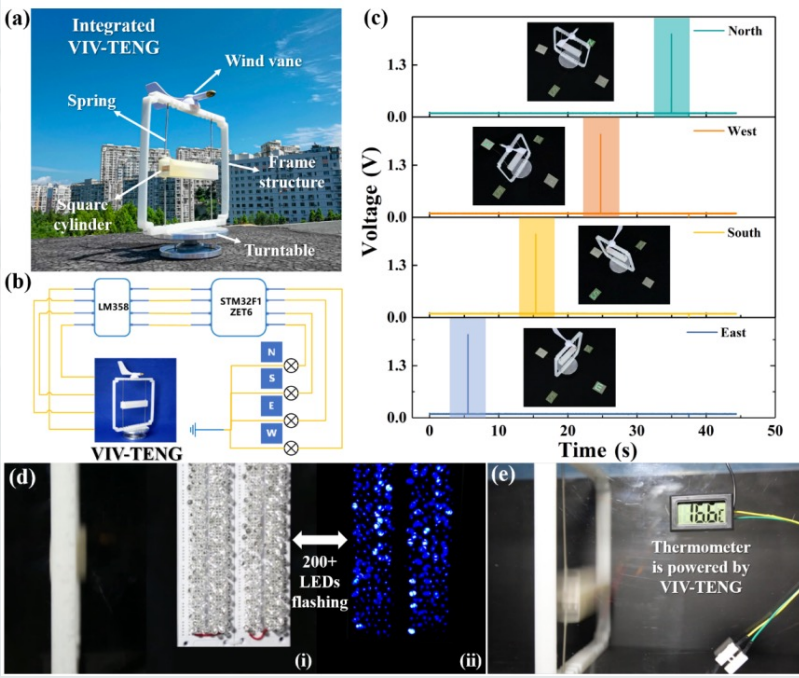
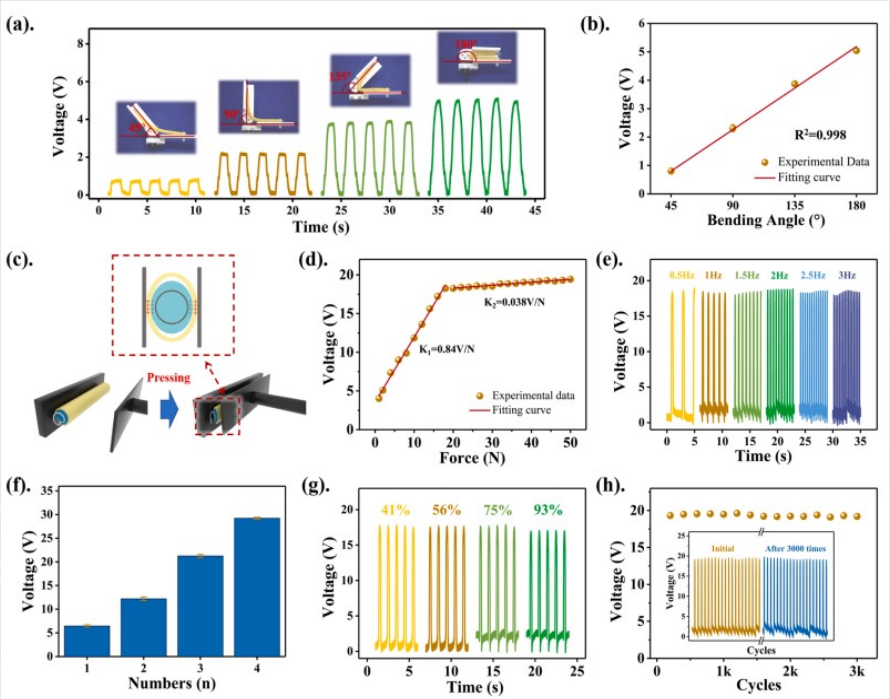
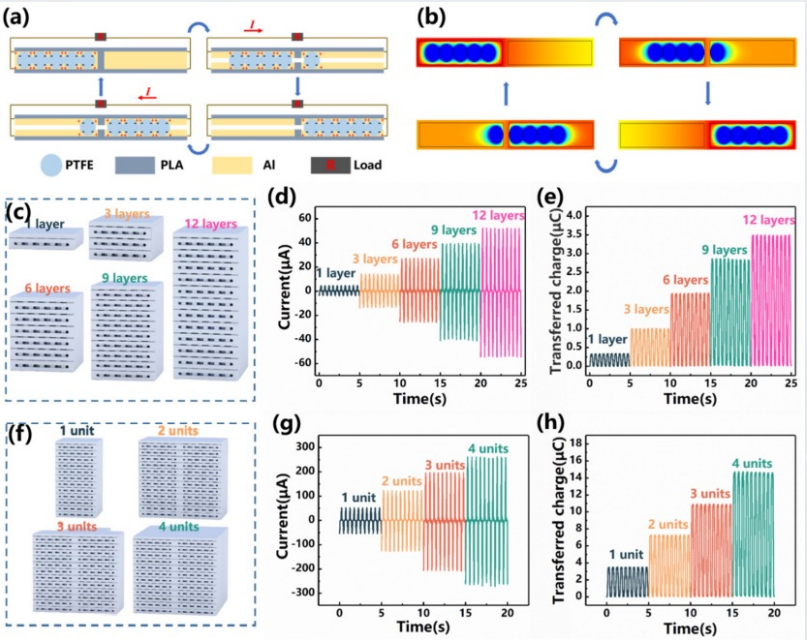
论文——用数据说话，用图片表达，用逻辑自洽

➤ 图片是写作中最重要的一环，要求既包含数据，又必须体现论文的逻辑关系

Tips

1. 配色要以突出关键数据、展示逻辑关系为**首要原则**。
2. 尽量选**柔和**的颜色，避免过明、过暗、过亮冷色调。
- 3. 一篇论文的配图，选取一个**主色调**（1/3到一半）、使用**近似色**作为辅助色。其他颜色为**互补色**、**组合色**。

配色要以突出关键数据、展示逻辑关系为首要原则，同时尽可能采取示意图数据图相组合的形式



Hao Wang et al., *Nanomaterials*, 2022

Cong Zhao et al., *Nano energy*, 2022

Yan Wang et al., *Nano research*, 2021

一篇论文的配图，选取一个主色调（1/3到一半）、使用近似色作为辅助色。其他颜色为互补色、组合色

Research

3

4

Research

6

Research

Research

7

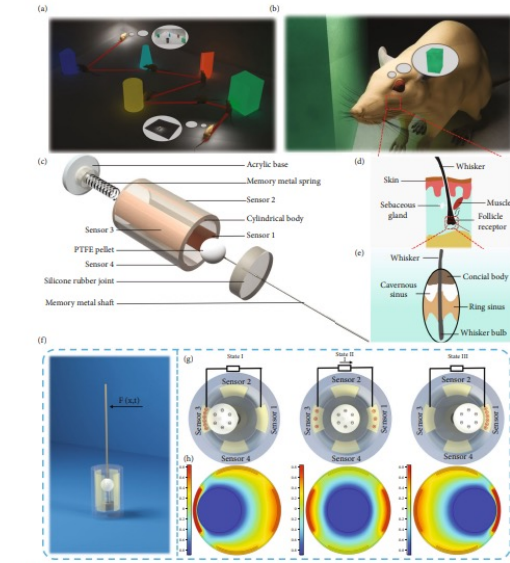


FIGURE 1. Structure and working mechanism of a TWS. (a) A mouse in darkness explores the environment with its whiskers. (b) Measuring both the orientations and distances from obstacles. (c) Location of tactile receptors beneath the surface of the skin. (d) The structure and innervation of a rat whisker follicle. (e) Basic structure of the bionic follicle whisker sensor. (f) Frontal view of the working components. (g) Schematic charge distribution as the PTFE pellet moves. (h) Simulation results showing the potential distribution between the PTFE pellet and Cu film.

and then reaches a plateau. This is because increasing the displacement w_0 can decrease the distance between the PTFE pellet and Cu electrodes and increase their contact forces. From [22], increasing mechanical compression between the PTFE pellet and Cu electrodes causes an increased output voltage. However, due to material limita-

tions and the size of the TWS, the output voltage saturates the sensor. Moreover, a leave-one-out cross-validation (LOOCV) strategy was used to fit the 1 model, and the detection accuracy and generalization performance of these models are shown in Figure 2(c). This confirms that the quadratic model has a high correlation coefficient of

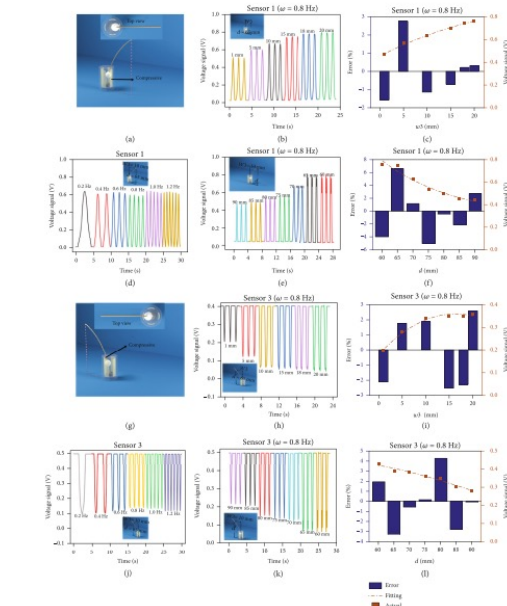


FIGURE 2. Experimental results. (a) The 3DMax model of the whisker sensor and its deflection along the 1 direction. (b) Response due to bending by $w_0 = 1 \text{ mm} \sim 20 \text{ mm}$ in the 1 direction. (c) LOOCV validation for evaluating accuracy and generalization performance of 1 regarding w_0 . (d) Response from 0.2 Hz to 1.2 Hz in the 1 direction. (e) LOOCV validation for evaluating accuracy and generalization performance of 1 regarding d . (f) 3DMax model of a whisker and deformation along the 3 direction from its relaxed state. (g) Response due to bending by $w_0 = 1 \text{ mm} \sim 20 \text{ mm}$ along the 3 direction. (h) LOOCV validation for evaluating accuracy and generalization performance of 3 regarding w_0 . (i) Response performance from 0.2 Hz to 1.2 Hz in the 3 direction. (j) Response performance at height $d = 60 \text{ mm} \sim 90 \text{ mm}$ in the 3 direction. (k) LOOCV validation for evaluating accuracy and generalization performance of 3 regarding d .

6

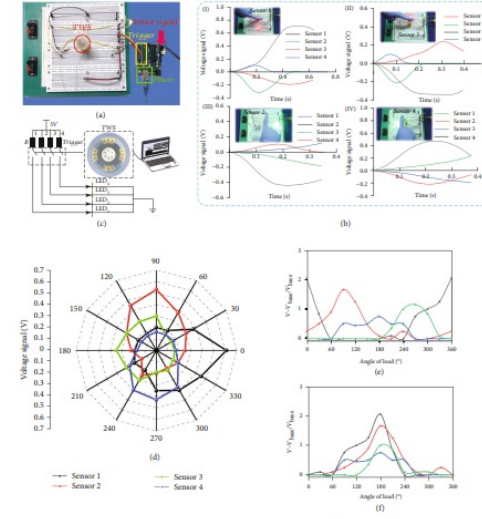


FIGURE 3. Experimental results. (a) Experimental electronic setup. (b) Demonstration of TWS as a sensitive load switch control and its corresponding output voltage signal. (c) Electronic module used for potential application demonstrations, such as controlling LED lights. (d) Directional patterns of the TWS. (e) Rotation from 0° to 360° and ΔV for each angle with the same load applied. (f) The results of (e) were replotted with 0 defined.

processor was used for data processing, which provides 472 GFLOPS (billion floating-point operations per second) with only 5 W of power consumption. Information gathered by the JetBot is sent to a computer and vice versa through a Wi-Fi network. In addition, to better track the trajectory between position updates, the JetBot utilizes dead reckoning from encoder information located on the drive motors.

In the prescribed workspace, a preplanned path is traversed by a cascade controller, where feedforward and feed-

back controls are used to ensure high accuracy, in which JetBot is fully autonomous as it drives along the preplanned path. It is worth noting that the robot adopts a stepping movement with maximum speed of 1 cm/s as JetBot has enough time to respond to the TWS, while a robot with higher speed could cross the workspace boundary in the limited experiential space. Figure 4(c) shows the process used to implement reactive obstacle avoidance. As soon as a landmark is recognised by the TWS, the feedback controller

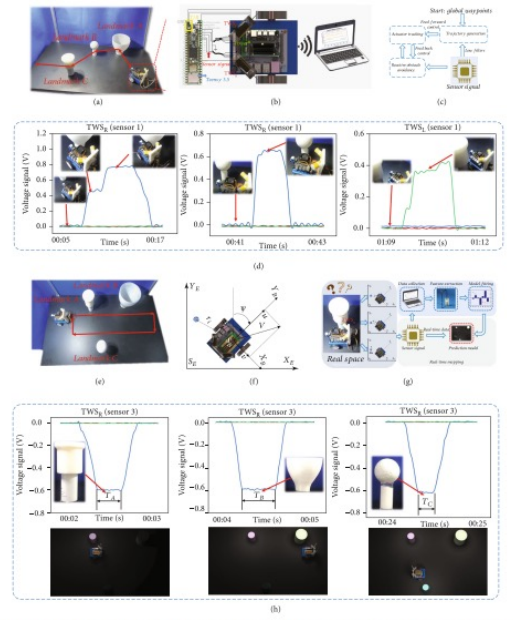


FIGURE 4. Experimental results. (a) Photographs of the actual workspace for reactive obstacle avoidance. (b) Electronic module used for potential application demonstrations, such as reactive obstacle avoidance and local mapping. (c) Overview of the closed-loop control system for reactive obstacle avoidance. (d) Voltage signal measured at landmarks A, B, and C. (e) Photographs of the actual workspace used for local mapping. (f) Reference frames BODY reference frame and NED reference frame. (g) Local mapping process, where sensory information is applied for model fitting and real-time model prediction. (h) Voltage signal measured at landmarks A, B, and C.

Peng Xu et al., *Research*, 2021 (cover paper)

一篇论文的配图，选取一个主色调（1/3到一半）、使用近似色作为辅助色。其他颜色为互补色、组合色

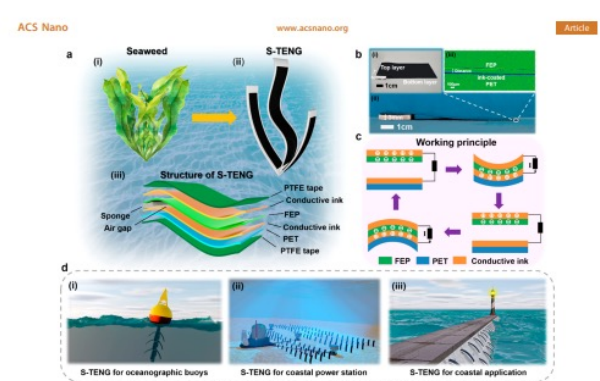


Figure 1. Schematic drawing of the S-TEG and its applications: (a, i) seaweed, the bionic prototype of the S-TEG; (a, ii) the S-TEG profile; (a, iii) the S-TEG internal structure. Photos of the S-TEG (b, i) and (b, ii) side view of it, and (b, iii) side view of the material surface morphology on the S-TEG. (c) Working mechanism of the S-TEG. (d) Applications of the S-TEG on the marine internet of things.

random wave induced motions. The T-TEG appears to be a quite effective approach of large-scale wave energy harvesting. An *et al.*¹⁰ have created a whirling-folded TENG (WF-TENG) wave energy converter. Variations of output performances with respect to the wave parameters and the structural parameters were investigated systematically. A maximum peak power of 6.5 mW and an average power of 0.28 mW were obtained by the WF-TENG, which is capable of powering a digital thermometer. In a study on a fully enclosed TENG wave energy converter published by Wang *et al.*,¹¹ optimizations of materials and structures were conducted. Low frequency wave energy was converted to power light-emitting diodes (LEDs) and to charge different supercapacitors to the rated voltage. In general, these published wave energy TENGs have exhibited advantages such as having a simple structure and low cost and being lightweight and robust. However, most of the previously published wave energy TENGs are designed for harvesting energy from the ocean surface waves. Though the majority of the marine applications are surface ones, supplying renewable electricity to underwater applications should not be left out. In order to encompass energy harvesters in a larger volume of the ocean to provide power to the MIoT sensors, a wave energy TENG that can work at both surface areas (floating) and underwater areas (submerged) is desperately needed. On top of that, the wave energy TENG will be more impressive if it can be easily integrated with the marine equipment.

In this study, a flexible seaweed-like triboelectric nanogenerator (S-TEG) is first proposed to supply *in situ* power to marine distributed sensors. The idea of developing a seaweed-like TENG is inspired because of the close

observations we made on a common sea plant, seaweed. The process in which the seaweed vibrates with the wave is a process of converting wave energy to mechanical energy. The flexible S-TEG converts the wave energy into electricity through its distinctive structure. Systematic wave tank experiments were performed to study the vibration and electric characteristics of the S-TEG under various geometric and dynamic parameters. Multiple S-TEGs have been tested to power either the LEDs or the thermometer in different marine scenarios. Considering that the majority of the MIoT sensors work with micro power, the S-TEG could become an effective approach of powering a variety of marine sensors in the MIoT.

RESULTS AND DISCUSSION

Structure and Working Principle of the S-TEG. The bionic prototype that inspired us to develop the seaweed-like structure to harvest wave energy is shown in Figure 1a(i). From the observation that the seaweed vibration has converted much of the wave kinetic energy successfully to heat, a flexible seaweed-like triboelectric nanogenerator is first proposed (see Figure 1a(ii)). As shown in Figure 1a(iii), the S-TEG is made by a conductive ink-coated fluorinated ethylene propylene (FEP), a conductive ink-coated polyethylene terephthalate (PET), and two polytetrafluoroethylene (PTFE) membranes. Sealed inside the PTFE layer, the triboelectric friction layers, the FEP and PET membranes, are protected from any contact with water that would cause the electric materials to lose their surface charge. Figure 1b(i) displays the S-TEG sample. To further show the air gap between two triboelectric layers, the photo of the side view of

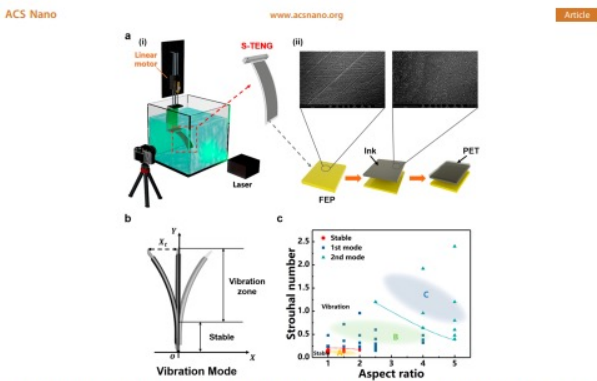


Figure 2. Experimental apparatus and vibration characteristics of the S-TEG: (a, i) Experimental apparatus of the S-TEG; (a, ii) scanning electron microscope (SEM) photo of the FEP and conductive ink-coated PET; (b) 1st mode of the S-TEG and coordinate system selection diagram; (c) the vibration regime map of the S-TEG.

the sample is taken in Figure 1b(i) and the micro view is measured by the electron microscope LEXT OLS4000, which is shown in Figure 1b(ii). From above, the air gap due to the sponge and surface morphology of the FEP and ink-coated PET film can be observed. The device (Figure S1) with concave structures makes contact electrification and electrostatic induction simultaneously, ensuring a good correspondence between the wave and electrical signal of the S-TEG. Certain nondimensional parameters have been applied to represent elasticity and fluid pressure on the structure. The length (*l*) is usually expressed by the nondimensional aspect ratio l/w ,⁵⁰ where *w* is the width of the S-TEG. The vibration frequency (*f*) is usually expressed by the Strouhal number ($St = f \cdot l/U$). The S-TEG's vibration under the wave excitation is a typical forced vibration. The S-TEG can be approximated as a thin two-dimensional structure with high extensional rigidity and low bending rigidity, which satisfies the Euler-Bernoulli beam equation⁵¹

$$V = -\frac{Q}{\epsilon_0 S} (d_0 + y(i)) + \frac{\sigma y(i)}{\epsilon_0} \quad (1)$$

where *Q* is the total transferred charge; d_0 , ϵ_0 , and *S* represent the thickness of the membrane, the dielectric constant in vacuum, and the area size of the electrode, respectively; *y* denotes the displacement between the dielectric membrane and the electrode; σ denotes the charge density. According to the eq 1, the maximum displacement between the dielectric membrane and the electrode determines the maximum output of the S-TEG. The displacement between the dielectric membrane and the electrode changes as the S-TEG vibrates with the wave.

To better show the working principle of the S-TEG, the potential distributions across the two electrodes have been analyzed with COMSOL, a finite-element software for Multiphysics analysis as shown in Figure S3. The contour clearly depicts the potential difference driving the current between the two electrodes. Owing to its flexible essence, the S-TEG can be applied (as a power supply module) to many marine applications, such as floating buoys (surface), coastal power stations (underwater), and breakwaters (seashore), as shown in Figure 1d.

Vibration and Electric Performance of the S-TEG. As shown in Figure 2a(i), a linear motor was used to simulate the vibration of the S-TEG excited by the wave, and laser imaging was adopted to better observe the vibration performance of the S-TEG. The microstructure of the FEP and ink-coated PET film can be observed by a scanning electron

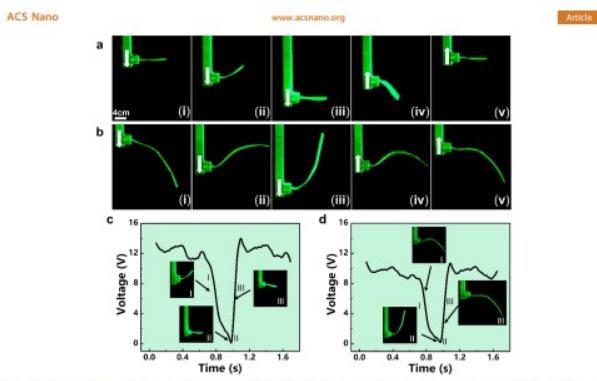


Figure 3. Sequential images of vibration behavior and analysis of the electrical signal for the 1st mode: (a) 1st mode: vibration behavior of the S-TEG with the dimensions 40 × 80 mm; (b) 2nd mode: vibration behavior of the S-TEG with the dimensions 40 × 200 mm. The voltage signal of the S-TEG corresponding to (c) the 1st mode; (d) the 2nd mode.

microscope Phenom Pro image as shown in Figure 2a(ii). The device with concave structures made contact electrification and electrostatic induction simultaneously, ensuring a good correspondence between the wave and electrical signal of the S-TEG. Certain nondimensional parameters have been applied to represent elasticity and fluid pressure on the structure. The length (*l*) is usually expressed by the nondimensional aspect ratio l/w ,⁵⁰ where *w* is the width of the S-TEG. The vibration frequency (*f*) is usually expressed by the Strouhal number ($St = f \cdot l/U$). The S-TEG's vibration under the wave excitation is a typical forced vibration. The S-TEG can be approximated as a thin two-dimensional structure with high extensional rigidity and low bending rigidity, which satisfies the Euler-Bernoulli beam equation⁵¹

where *m* is the mass per unit area, *D* is the nondimensional bending stiffness of the structure, *ω* is the displacement of the S-TEG along the *X*-coordinate, and Δp is the hydrodynamic pressure difference, which is induced by the waves across the structure. Among these parameters, the nondimensional bending stiffness (*D*) is what governs the vibration of a thin two-dimensional structure (*e.g.*, the S-TEG).^{52,53} *D* is defined as

$$m \partial^2 \omega + D \partial^4 \omega = -\Delta p \quad (2)$$

where *m* is the mass per unit area, *D* is the nondimensional bending stiffness of the structure, *ω* is the displacement of the S-TEG along the *X*-coordinate, and Δp is the hydrodynamic pressure difference, which is induced by the waves across the structure. Among these parameters, the nondimensional bending stiffness (*D*) is what governs the vibration of a thin two-dimensional structure (*e.g.*, the S-TEG).^{52,53} *D* is defined as

$$D = \frac{Eh^3}{12(1 - \nu^2)\rho_l U^2 L^2} \quad (3)$$

where *h* is the Poisson's ratio, ρ_l is the fluid density, *U* is the wave velocity, *h* is the thickness of the S-TEG, *L* is the structure length, and *E* is the Young's modulus. Since the

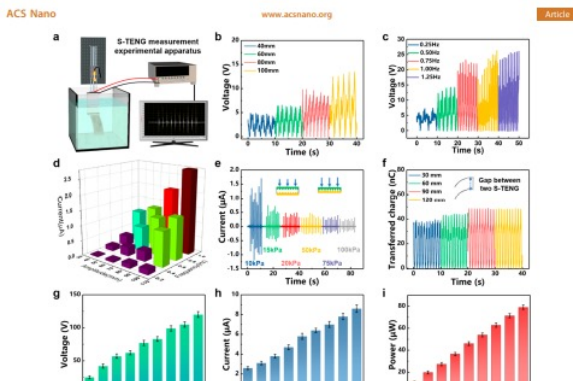


Figure 4. Output performances of the S-TEG: (a) Experimental apparatus of the S-TEG; (b) the effects of the linear motor's motion amplitude on the open-circuit voltage of the S-TEG; (c) the effects of the frequency of the linear motor on the open-circuit voltage of the S-TEG; (d) a 3D graph of the output current under different amplitudes and frequencies of the linear motor; (e) the output current of the S-TEGs under different pressures; (f) the transferred charge of the S-TEG with different parallel distances; (g) the output voltage of the S-TEGs with different numbers of units; (h) the output current of the S-TEGs with different numbers of units; (i) the output power of the S-TEGs with different numbers of units.

number. The dimension will influence the vibration mode but not the vibration frequency.

Figure 3a,b presents the sequential images of the first mode vibration and second mode vibration. In the first mode for the S-TEG, only one vibration crest occurred during the whole vibration process. The S-TEG is horizontal on its equilibrium condition (Figure 3a(i)). In the first half of a vibration cycle, the S-TEG first reaches the largest upward displacement (Figure 3a(ii)), then, the S-TEG returns back to the horizontal equilibrium position (Figure 3a(iii)). In the remaining half cycle, the S-TEG reaches the largest downward displacement (Figure 3a(iv)) before it returns back to the horizontal equilibrium position (Figure 3a(v)). The periodic vibration leads to periodic contact separation between the internal dielectric material and the electrode. The process of the second mode vibration (see Figure 3b) is similar to the process of the first mode vibration except that there are two vibration crests in the second mode. When the profiles of the electrical signal and the vibration images are scrutinized, it can be observed that the vibration of the S-TEG yielded the following stages: starting to vibrate (Figure 3c(i)), reaching the maximum stroke (Figure 3c(ii)), and returning to the original condition (Figure 3c(iii)). These stages were also clearly reflected in the corresponding output voltage signals. The similar voltage signal can be observed in Figure 3d. However,

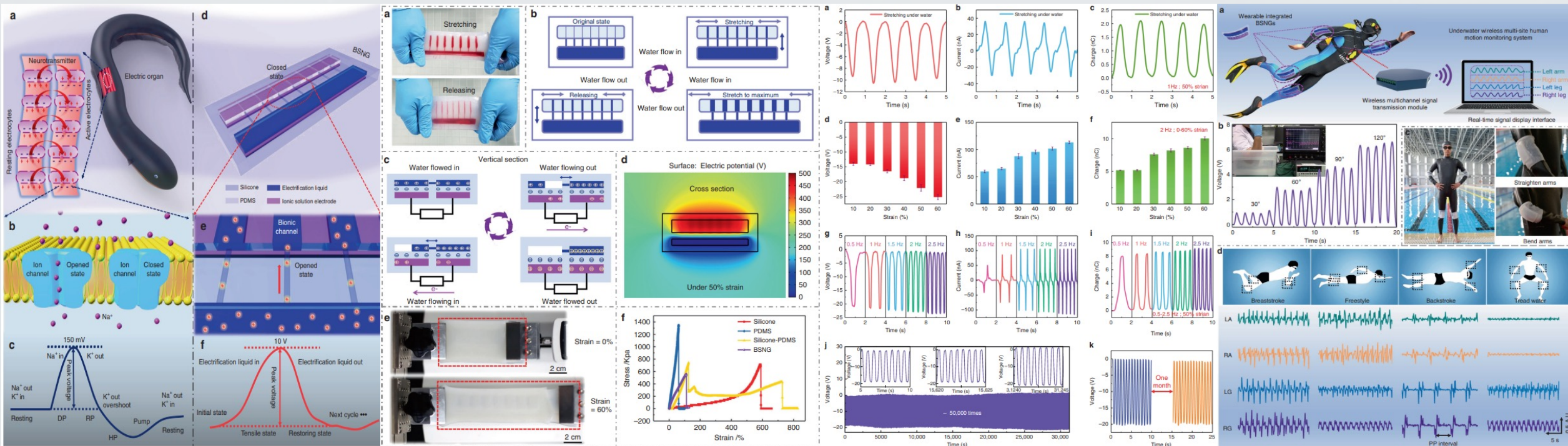
the maximum output voltage of the second mode is lower than the first mode. It is likely that the triboelectric electrons generated by the two opposite crests cancel out each other, which reduces the electric output of the S-TEG. Therefore, the first mode S-TEG turns out to be better for energy conversion.

As our studies have shown that the 40 × 80 mm S-TEG can be excited to the first mode under a wide range of Strouhal numbers (see Figure 2c), experiments on the S-TEG's electric performance were carried out with the 40 × 80 mm S-TEG dimension. The forced motion is generated by the linear motor reciprocating sinusoidally. The experimental apparatus is shown in Figure 4a. As shown in Figure 4b, larger motion amplitude can promote the output electrical signal: a maximum output voltage of 12.2 V was achieved with the transferred charge of 22.4 nC (Figure 5a). The output performance of the S-TEG is also positively correlated with the vibration frequency (Figure 4c): at the maximum wave frequency of 1.25 Hz, the open-circuit voltage reached 24.8 V with the transferred charge of 43.2 nC (Figure 5b). A series of experimental results were compiled, and Figure 4d presents the dependence of the output current on both the amplitude and the frequency of the S-TEG. The output current can be greatly enhanced by increasing the amplitude and frequency of the S-TEG.

Yan Wang et al., *ACS nano*, 2021

一篇论文的配图，选取一个**主色调**（1/3到一半）、使用**近似色**作为辅助色。其他颜色为**互补色**、**组合色**

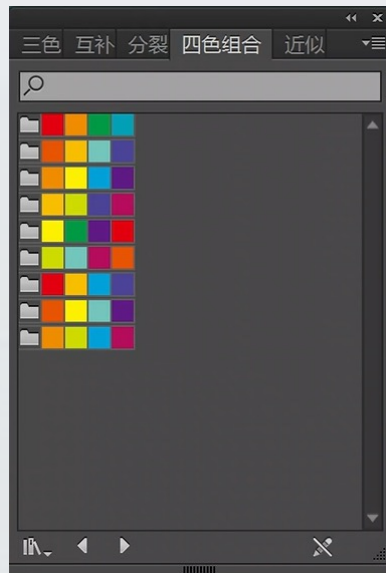
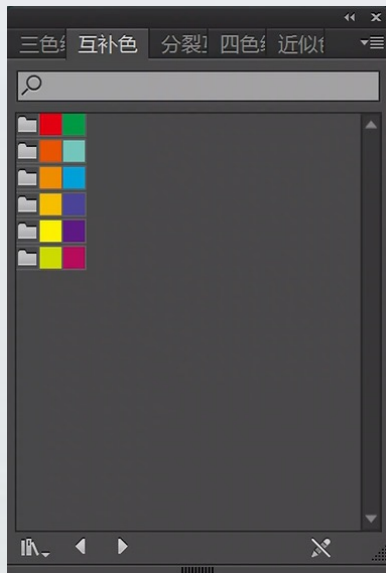
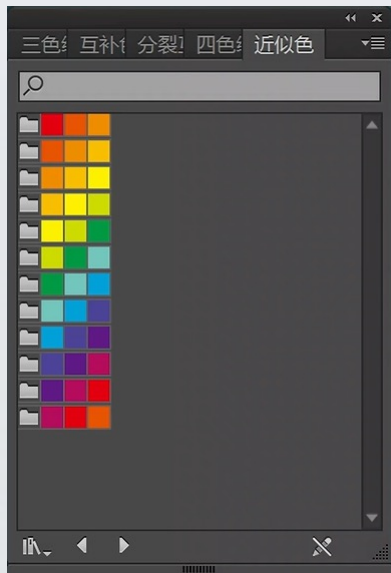
首尾呼应！



Zhou Li et al., *Nature communication*, 2019

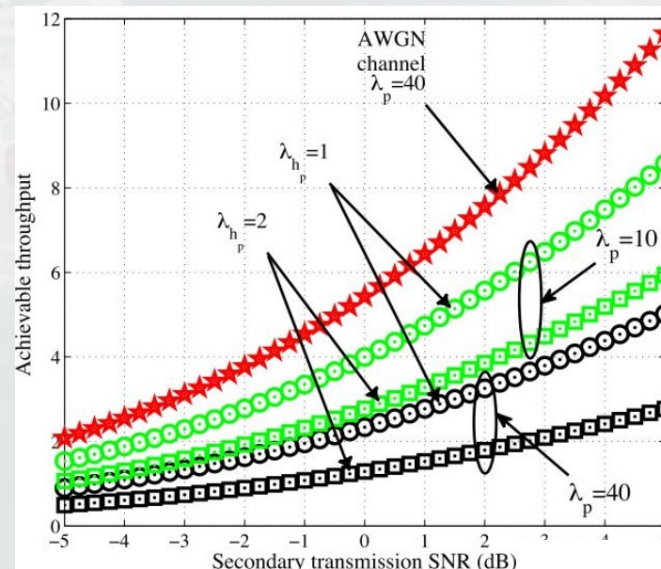
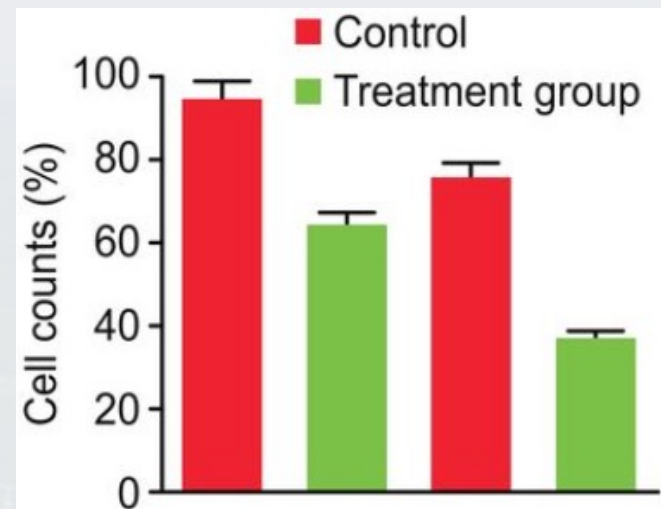


近似色、互补色、组合色



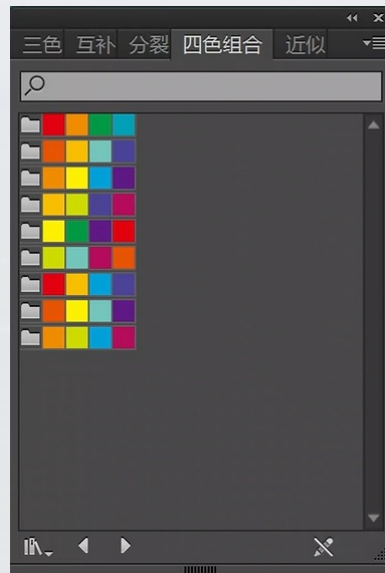
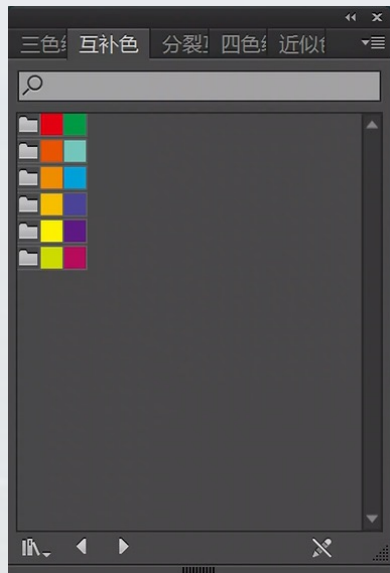
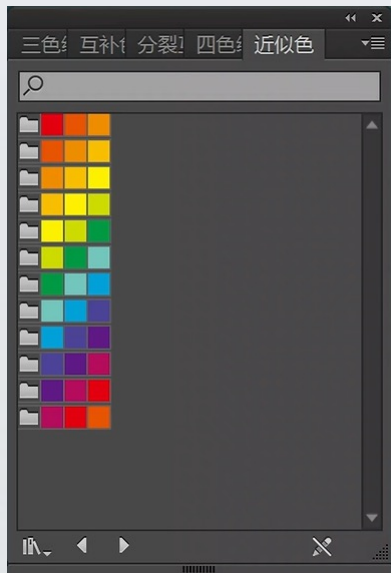
Tips

1. 两类数据之间最好不要使用互补色，三类及以上可以
2. 尽量选**柔和**的色调，避免饱和度过高/低
3. 颜色不宜过多、过杂，**避免**同一幅图中同时出现红绿色
4. 渐变背景较难驾驭，尽量用近似色



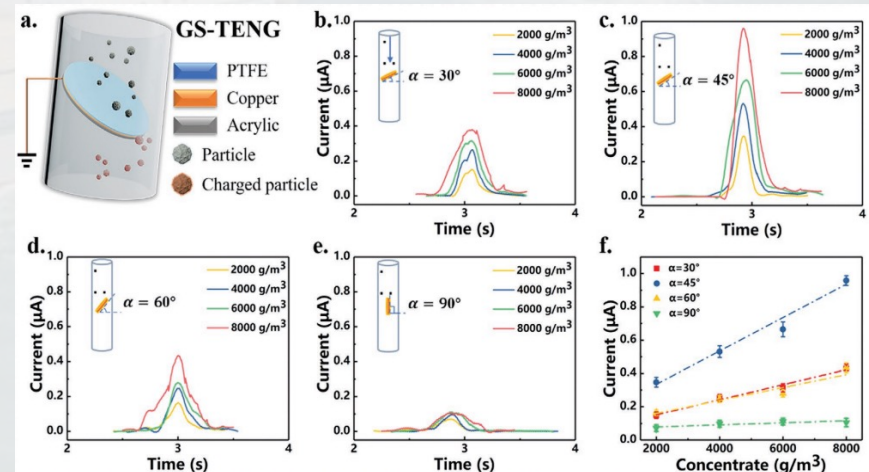
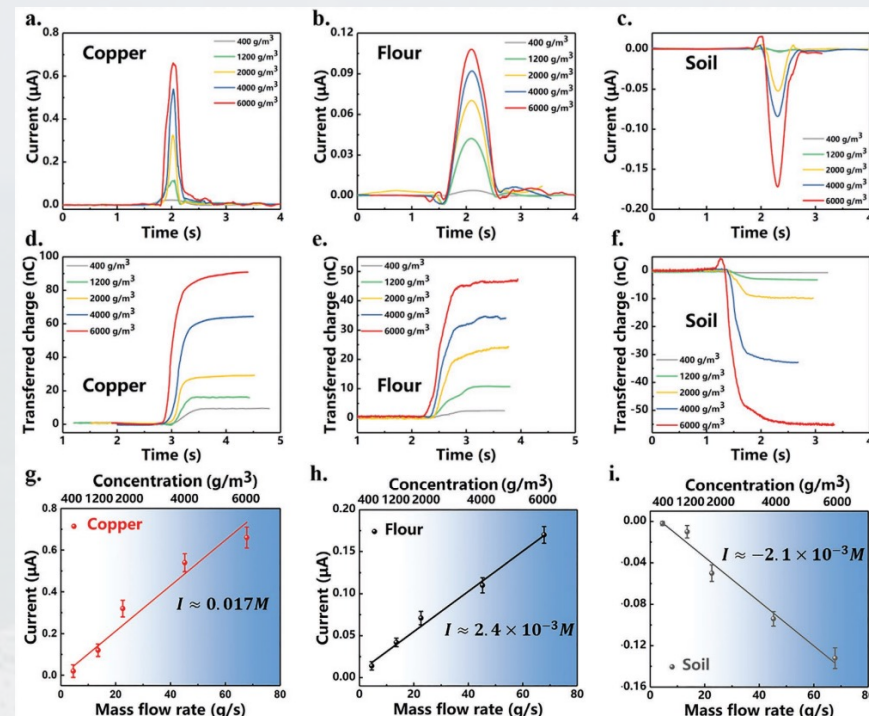


近似色、互补色、组合色



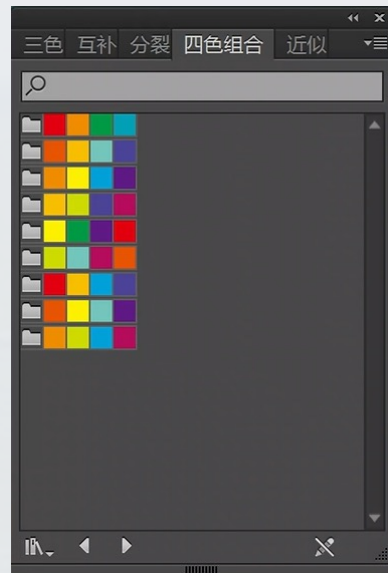
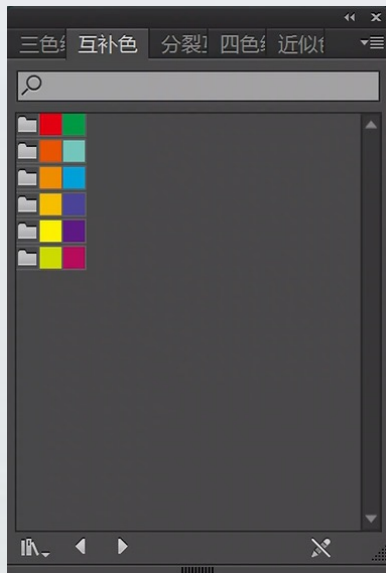
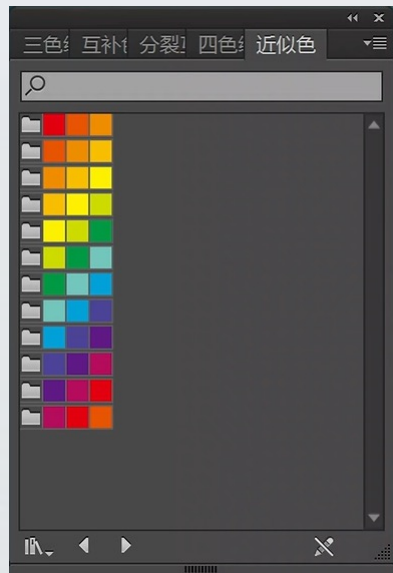
Tips

1. 两类数据之间最好不要使用红绿互补色，三类及以上可以
2. 尽量选**柔和**的色调，避免饱和度过高/低
3. 颜色不宜过多、过杂
4. 渐变背景较难驾驭，尽量用近似色



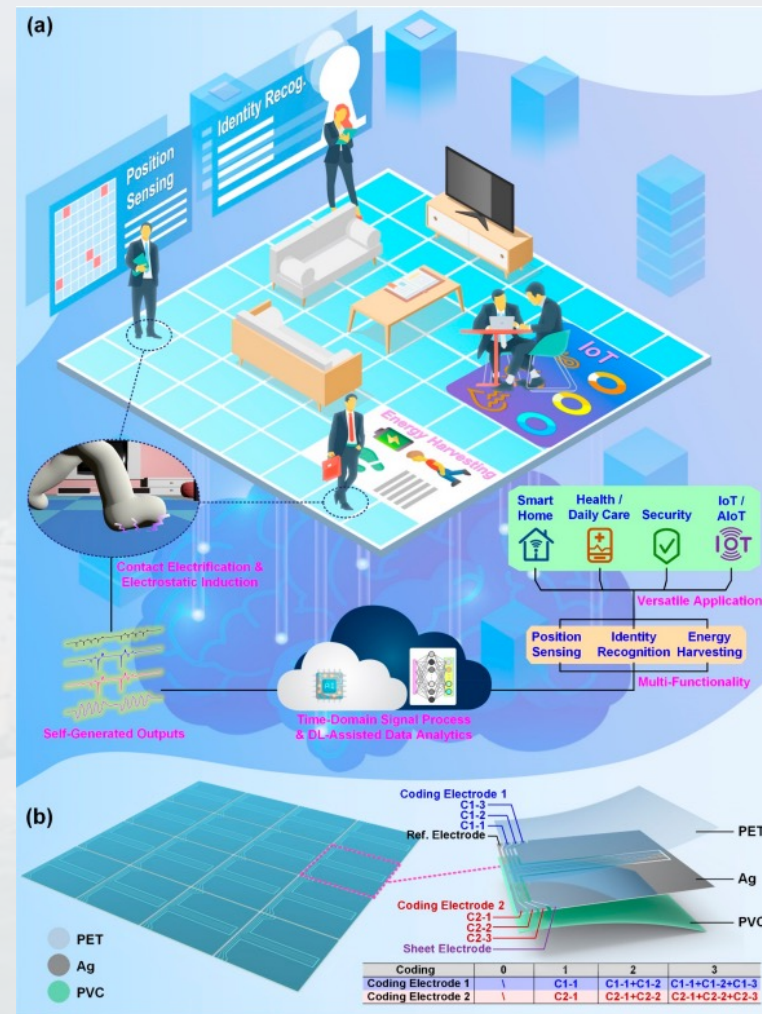


近似色、互补色、组合色



Tips

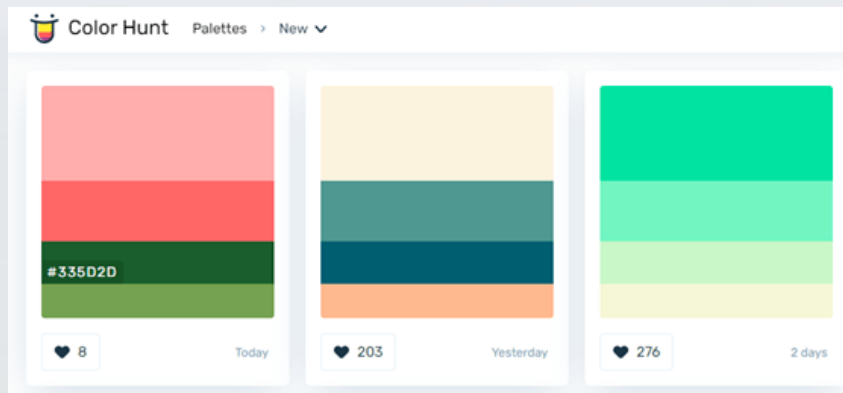
1. 两类数据之间最好不要使用互补色，三类及以上可以
2. 尽量选**柔和**的色调，避免饱和度过高/低
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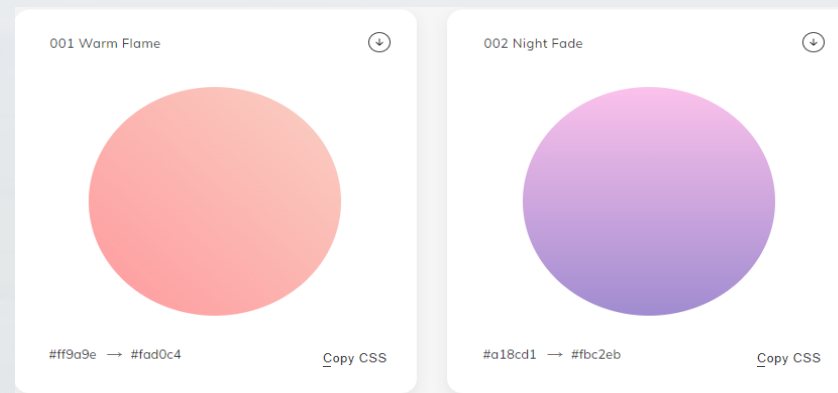
Chengkuo Lee et al., *ACS nano*, 2021



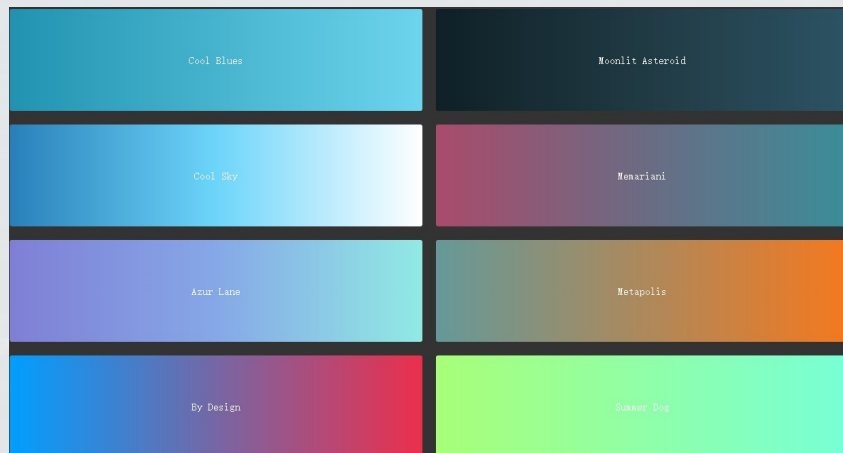
常用的配色网站



<https://colorhunt.co/>



<https://webgradients.com/>



<https://uigradients.com/>



<http://zhongguose.com/>



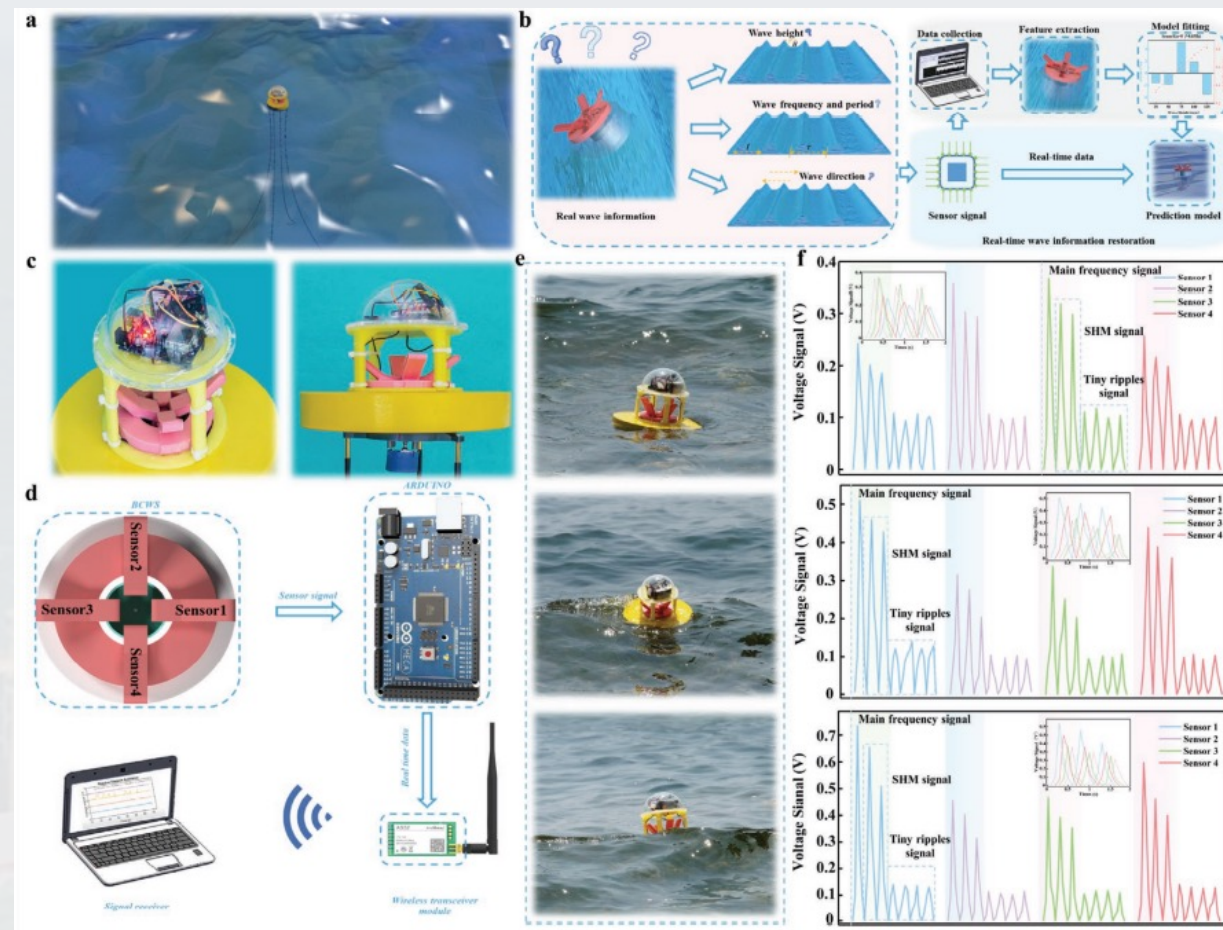
论文大图的构思与排版

1. 正文部分整体框架（5-6张大图）

- 场景、器件（1-2张）
- 实验部分（2-4张）
- 实验演示（1张）
- 每部分之间逻辑递进

2. 每一部分格局框架

- 美化排版（ $3 \times 2 / 2 \times 2$ ）
- 实验部分不建议做 2×3
- 每张小图不一定等大（虚线框架）
- 错落有致、分布均匀
- 多余的数据放Supporting Information



Xinyu Wang et al., *Adv. Mater. Technol.*, 2021

先定框架再下笔！



论文大图的构思与排版

器件示意图

实物图与表面形貌

工作原理

场景1

场景2

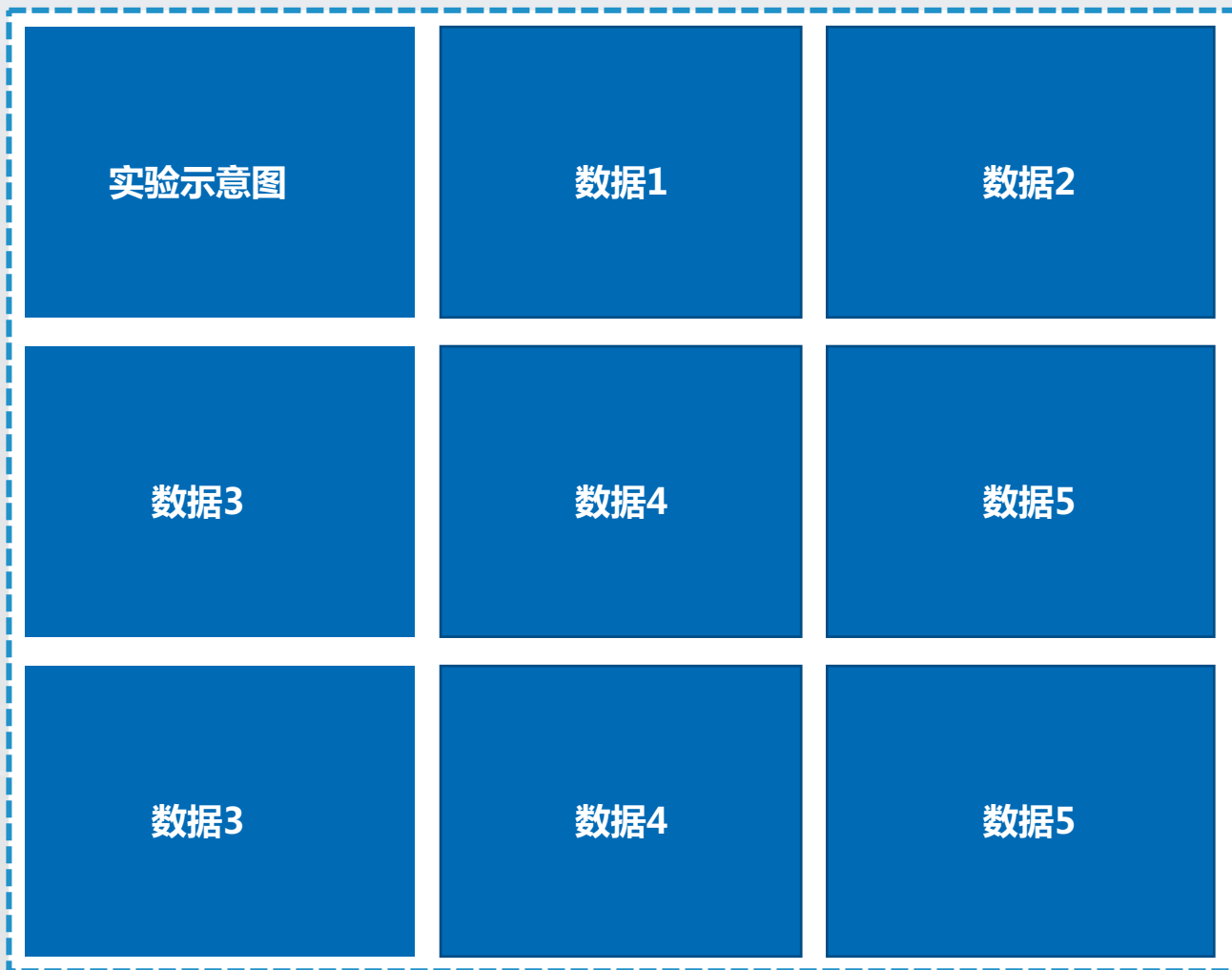
场景3

Tips

1. 背景全白（RGB255）/透明
2. 不一定构建外部框架
3. 图片等大、对齐
4. 图片文字批注不用艺术字、不斜体
5. 先定框架，再做细节处理
6. 图片去白对齐、柔化边缘、亮度锐化
7. 用数据图填满大图，而不是用示意图填满大图！



论文大图的构思与排版



一张六宫格实验数据图的文章工作量远远不够！

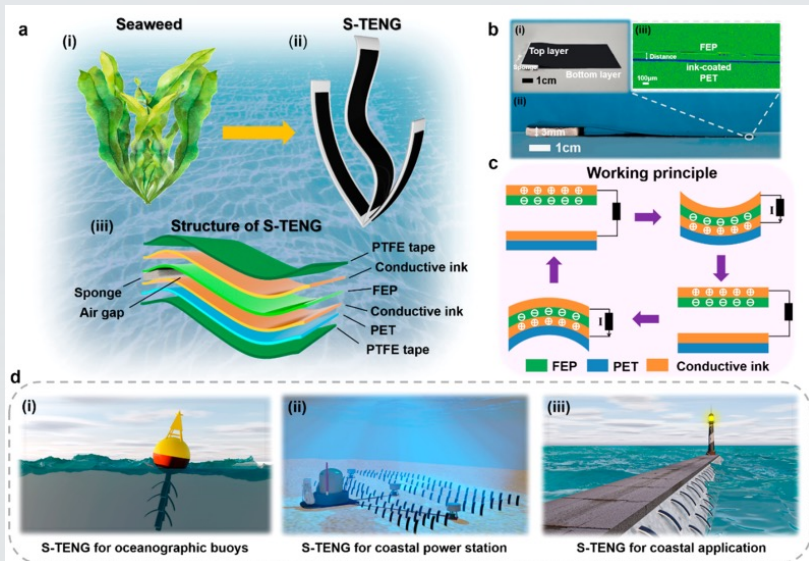
论文的本质依然是**用数据说话**！

Tips

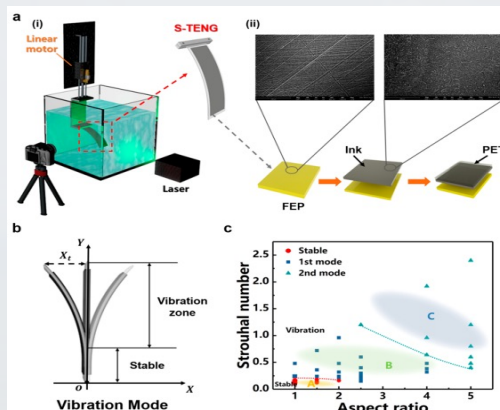
1. 背景全白（RGB255）/透明
2. 不一定构建外部框架
3. 图片等大、对齐
4. 图片文字批注不用艺术字、不斜体
5. 先定框架，再做细节处理
6. 图片去白对齐、柔化边缘、亮度锐化
7. 用数据图填满大图，而不是用示意图填满大图！
8. 择优择重点，多余的图放SI



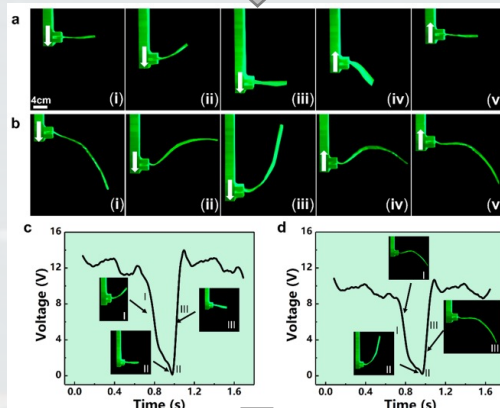
总一分一总



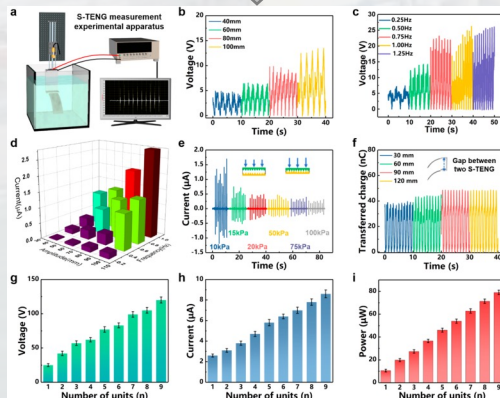
总：××场景提出××器件



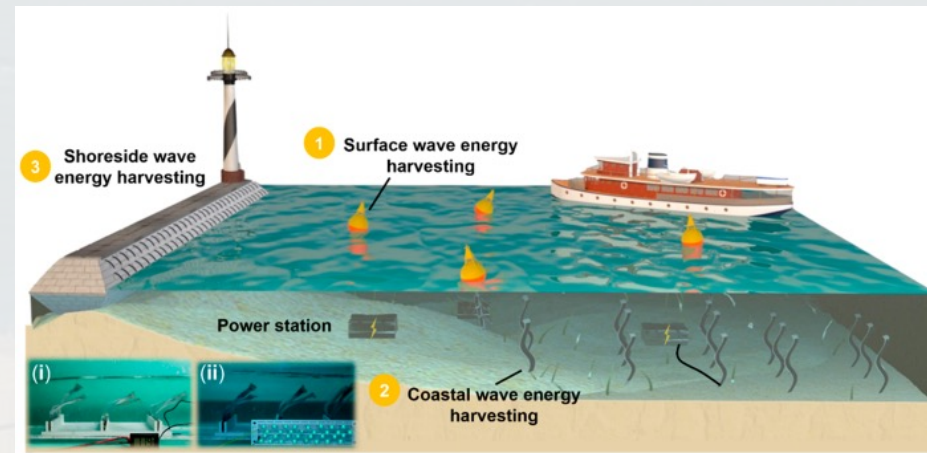
动力学模型 实验装置



摆动特性



最优解（是什么，怎么样）



总：××器件未来应用于××场景



目录 ontents



大连海事大学
DALIAN MARITIME UNIVERSITY

「01」 论文图片绘制

「02」 汇报PPT绘制

「03」 总结与心得



文献汇报PPT的构思与排版

1. 逻辑梳理

- 摘要（为什么做、怎么做、结论与展望）
- 研究背景（1页）、实验部分（3-6页）、结论（1页）
- 每部分体现**逻辑递进**

2. 每一部分排版

- 研究背景采用递进式
- 主体部分采用图片+结论（左右式、上下式）
- 图文并茂，不等于所有图文复制粘贴！
- 关键字/词/句的**提炼与标注**

汇报过程又快又准

让别人看懂，让自己说透

体现汇报人自己的思考



研究背景



行业痛点

锂枝晶的生长影响锂电池的安全性能和容量



关键问题

固体电解质界面 (SEI) 的改性或重建



研究方案

精确控制电解质分解，尤其 C-F 解离化学，构建富含 LiF 的 SEI

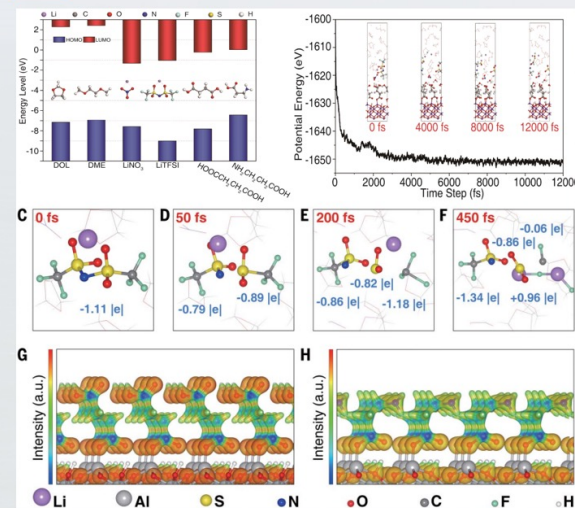


科学问题

无序和分散的官能团变得有序和紧密堆积时，氟化成分的降解动力学分析



SAMs模拟探究



结论

- LiTFSI 具有最低的 LUMO 能级 (-1.03 eV) 容易得电子。
- $\sim 1|e|$ 电荷在 50 fs 时从羧基转移到 TFSI⁻ 阴离子，导致 N-S 键断裂
- Al₂O₃ 到羧基更明显电荷转移
- SAMs 表面定向极性官能团将电子从 Al₂O₃ 基板吸引到电解质
- 多余电子有助于 LiTFSI 分解成 F⁻，最终形成 LiF



工作汇报PPT的构思与排版

1. 逻辑梳理

- 研究背景、工作进展、下一步计划
- 合适的**应用场景**—国内外现状—TENG
- TENG只是一项技术，并非一件产品！

2. 排版方式

- 研究背景（1-2页）、**实验进展**（3-6页）结论（1页）
- 图文并茂、关键字/词/句的**提炼与标注**
- “主线任务”（多页）与“支线任务”（1页）进行排版
- 按照时间线定期排列、按进度表定期总结（1页）

重视**迭代过程**，保存平时的后处理照片/数据图

多拍照，无意的照片可能会是整项工作的点睛之笔！





目录 ontents



大连海事大学
DALIAN MARITIME UNIVERSITY

「01」 学术论文图片绘制

「02」 工作汇报PPT绘制

「03」 总结与心得



总结与心得

技巧很重要，但**逻辑思维**更重要

- 审美需建立在整体性分析上
- 作图/PPT过程体现逻辑
- 保持美观、易懂、趣味性与科学性

Tips

1. 对整体的把控多思考。
2. 对细节的处理多练习。
- 3. 多参加学术讲座提升自己大局观和思维能力
勤能补拙，多学习、多动手锻炼自己。



常用科研软件

1. 三维模型建立/绘制

- Solidworks
- CAD

2. 模型渲染

- Cinema 4D
- 3dmax/ Maya
- Keyshot

3. 后处理

- Ps/ PPT (位图)
- Ai (矢量图)
- Pr/ Ae

4. 实验图绘制

- Origin
- Matlab
- python

5. 文档编辑与文献管理

- Office/ WPS
- Adobe Acrobat Reader DC
- Mendeley/ EndNote

6. 其他

- LabVIEW
- COMSOL
- Ansys



学汇百川 德济四海

Thank You !

