钱院学子在“明石杯”大赛中荣获佳绩！ The students of Qian Academy won good results in the "Akashi Cup" competition!

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钱院学子在“明石杯”大赛荣获决赛二等奖

The students of Qian Academy won the second prize in the final of the "Akashi Cup" competition

捷报频传 创新无限 Good news is frequent, innovation is unlimited

竞赛获奖 Contest Awards

2024中国大学生机械工程创新创意大赛——“明石杯”微纳传感技术与智能应用赛决赛二等奖

2024 China College Students Mechanical Engineering Innovation and Creativity Competition - "Sunstone Cup" Micro-Nano Sensing Technology and Intelligent Application Competition Final Second Prize

作品名称 Title of the work

“银芯探微”——一种银基可解耦温度的柔性应变传感器

"Silver Core Explorer" - a flexible strain sensor with decoupling temperature based on silver base

参与学生 Participating Students

赵政材 邓梦竹 徐童苗 Zhao Zhengcai, Deng Mengzhu, Xu Tongmiao

指导老师 Instructors

方续东 吴晨 Fang Xudong Wu Chen

创意火花 燃动烟台 The spark of creativity ignites Yantai

8月23日至8月25日，山东烟台，一场机械工程领域的创新盛会——"明石杯"微纳传感技术与智能应用大赛火热进行。来自全国各大高校的精英学子汇聚一堂，以创新为翼，以技术为剑，展开了一场智慧与激情的碰撞。

From August 23rd to August 25th, Yantai, Shandong, an innovation event in the field of mechanical engineering - "Sunstone Cup" Micro-Nano Sensing Technology and Intelligent Application Competition was hotly held. Elite students from major universities across the country gathered together to launch a collision of wisdom and passion with innovation as the wing and technology as the sword.

来自钱学森书院智造钱2101班级由赵政材，邓梦竹，徐童苗组成的"应变无温届队"在此次大赛中，凭借着卓越的创意与优良的作品，从众多参赛队伍中脱颖而出，荣获决赛二等奖！

The "Strain Warm Team" from the 2101 class of Qian Xuesen Academy, composed of Zhao Zhengcai, Deng Mengzhu and Xu Tongmiao, stood out from many participating teams and won the second prize in the final with its outstanding creativity and excellent works!

创意闪耀 技术为基 Creativity shines with technology-based

在柔性电子技术的迅猛进步背景下，柔性传感器已成为物联网、可穿戴技术和工业自动化等领域的关键组件。这些传感器能够实时监控多种物理参

数，并在多样化的环境和形态中维持稳定的运行，显著扩展了其应用范围。

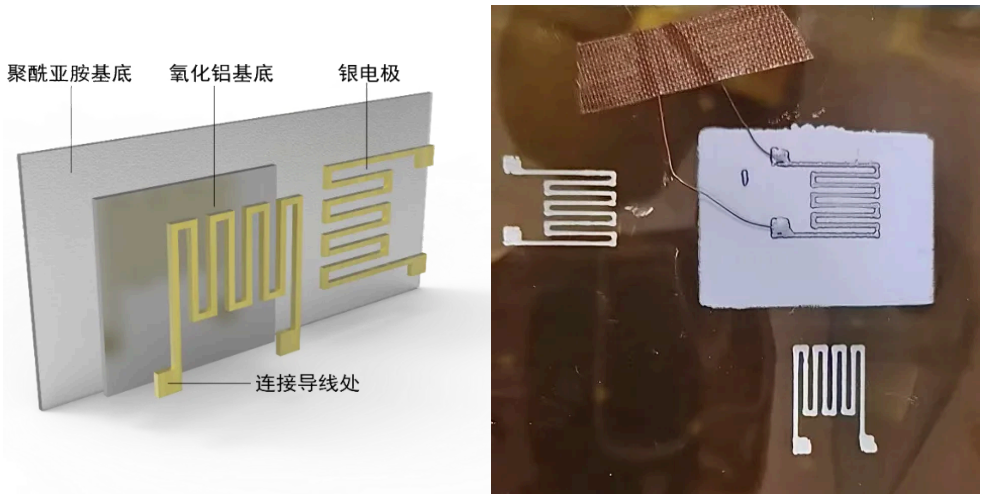
In the context of rapid advances in flexible electronics, flexible sensors have become a key component in fields such as the Internet of Things, wearable technology, and industrial automation. The ability of these sensors to monitor a wide range of physical parameters in real time and maintain stable operation in a variety of environments and morphologies significantly expands the range of applications.

然而，传统的应变传感器在高温条件下的性能表现不佳，其测量的应变信号常常受到温度信号的耦合，难以满足特定领域的要求。因此研发一种在高温环境下仍能保持高精度，高灵敏度，避免受到温度信号耦合的应变传感器至关重要。

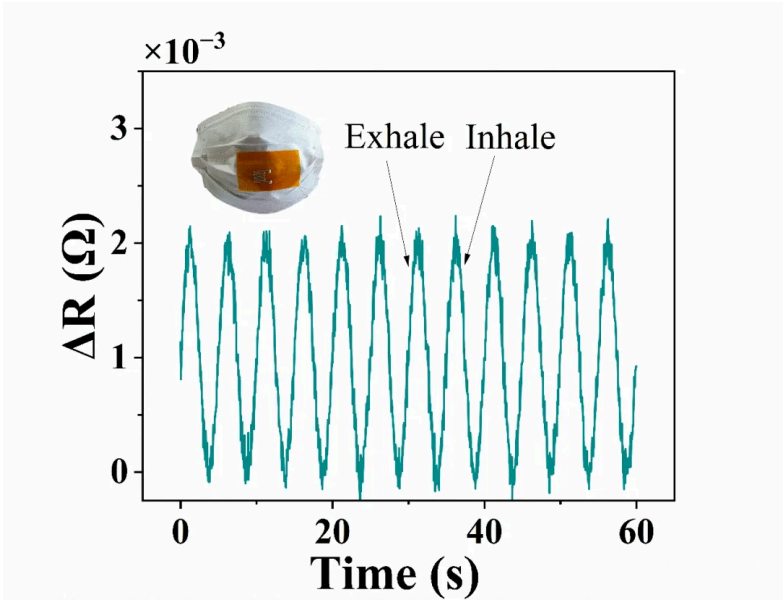
However, the performance of traditional strain sensors is not good at high temperatures, and the measured strain signals are often coupled by temperature signals, which is difficult to meet the requirements of specific fields. Therefore, it is important to develop a strain sensor that can maintain high accuracy and high sensitivity in a high-temperature environment and avoid being coupled by temperature signals.

赵政材，徐童苗，邓梦竹同学在班主任方续东老师的指导下，设计和制造了一种银基温度应变双模态柔性传感器，该传感器利用银基导电材料，结合油墨直写工艺和丝网印刷工艺，制造一种可解耦温度的柔性应变传感器，其可以独立测量应变和温度信号，并且利用神经网络算法对应变信号进行高温下的解耦，克服现有应变传感器在高温环境中的性能局限。

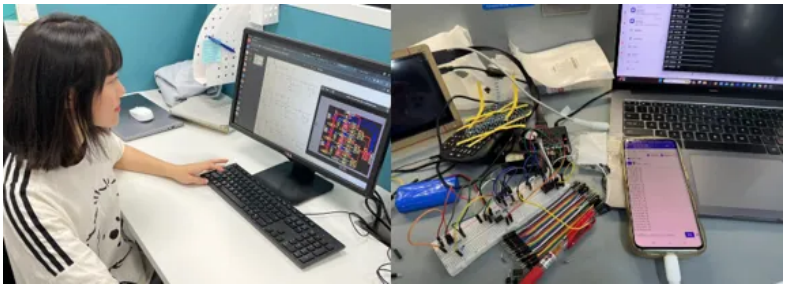
Zhao Zhengcai, Xu Tongmiao, and Deng Mengzhu, under the guidance of the class teacher Fang Xudong, designed and manufactured a silver-based temperature strain dual-modal flexible sensor, which uses silver-based conductive materials, combined with ink direct writing process and screen printing process, to fabricate a decoupling temperature flexible strain sensor, which can independently measure strain and temperature signals, and use neural network algorithms to decouple strain signals at high temperatures, so as to overcome the performance limitations of existing strain sensors in high temperature environments.



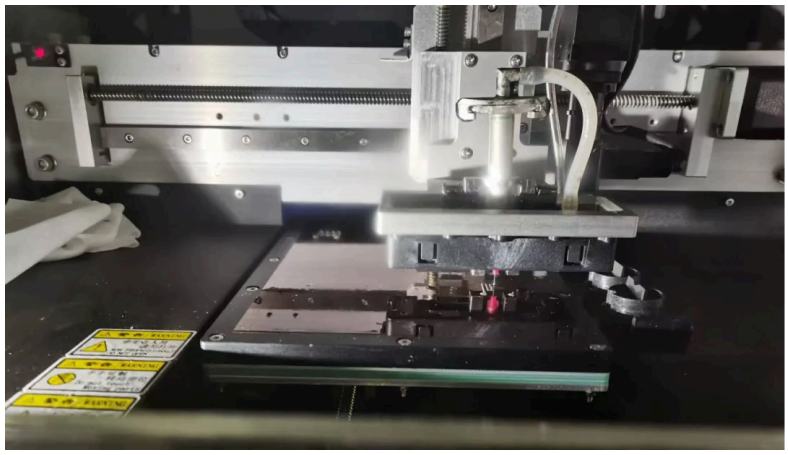
图：银基传感器的结构 Figure: Structure of a silver-based sensor



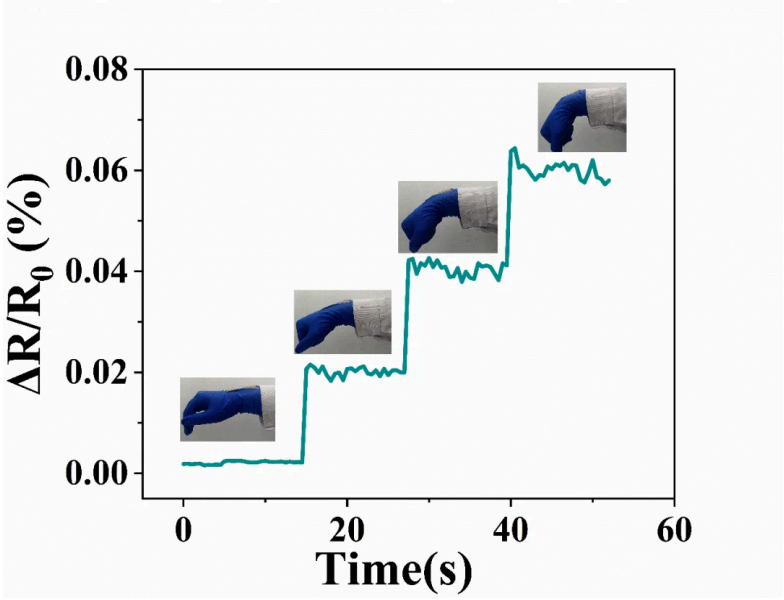
图：传感器用于检测人体呼吸信号 Figure: Sensors are used to detect human breathing signals



图：参赛队员（徐童苗）在检查绘制电路板 Pictured: Participating team members (Xu Tongmiao) inspect and draw circuit boards



图：参赛队员制作的油墨直写工艺制备银电极 Figure: The silver electrode is prepared by the ink direct writing process made by the participating team members



图：传感器用于检测手腕弯曲程度 Figure: Sensors are used to detect the degree of wrist flexion

团队协作 共创辉煌 Teamwork creates brilliance together

此次获奖，离不开赵政材，徐童苗，邓梦竹这三位团队成员之间的默契配合与共同努力。赵政材深入研究了银基导电材料的性质，确保其在高温环境下仍能保持稳定的电导性。同时，他还负责了油墨直写工艺和丝网印刷工艺的结合，优化了传感器的制造流程和结构设计。徐童苗设计了应变信号的采集和处理电路，负责了电路与数据采集系统的接口设计，进行应变信号的捕捉，使得精度可以达到小数点后两位，并确保信号能够顺利传输至数据处理模块。邓梦竹进行了实验的数据测量，评估传感器在不同温度和应变条件下的表现，确保算法能够准确地分离温度和应变信号。他们不仅在专业技能上不断突破，更在团队协作中展现了非凡的凝聚力。从方案设计到设计制

作，从数据测试到现场演示，每一步都凝聚着团队的智慧与汗水。

The award is inseparable from the tacit cooperation and joint efforts between the three team members Zhao Zhengcai, Xu Tongmiao and Deng Mengzhu. Zhao Zhengcai has conducted in-depth research on the properties of silver-based conductive materials to ensure that they can maintain stable conductivity in high-temperature environments. At the same time, he was also responsible for the combination of the ink direct writing process and the screen printing process, optimizing the manufacturing process and structural design of the sensor. Xu Tongmiao designed the acquisition and processing circuit of the strain signal, was responsible for the interface design of the circuit and the data acquisition system, and captured the strain signal, so that the accuracy could reach two decimal places, and ensured that the signal could be transmitted smoothly to the data processing module. Deng Mengzhu carried out experimental data measurements to evaluate the performance of the sensor under different temperature and strain conditions, and ensured that the algorithm could accurately separate the temperature and strain signals. They not only continue to break through in professional skills, but also show extraordinary cohesion in teamwork. From scheme design to design and production, from data testing to on-site demonstration, every step embodies the wisdom and sweat of the team.

智造钱2101班级的班主任方续东老师以其深厚的学术造诣和丰富的科研经验，为这三位同学提供了方向性的指导和理论支持。他鼓励团队成员大胆创新，亲自参与实验设计与数据分析，确保研究方向的准确性和可行性。方老师的指导，如灯塔般照亮了团队的科研之路，让团队在复杂的问题中找到了清晰的方向。

Mr. Fang Xudong, the head teacher of the 2101 class of Zhizaoqian, provided directional guidance and theoretical support for these three students with his profound academic attainments and rich scientific research experience. He encouraged team members to be bold and innovative, and personally participate in experimental design and data analysis to ensure the accuracy and feasibility of research directions. Mr. Fang's guidance illuminated the team's scientific research path like a lighthouse, allowing the team to find a clear direction in complex problems.

图：获奖证书 Pictured: Award Certificate

图：参赛队员（邓梦竹，赵政材）和方续东老师合影留念

Picture: The participating team members (Deng Mengzhu, Zhao Zhengcai) and Mr. Fang Xudong took a group photo

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