2023「中技社科技獎學金」

2023 CTCI Foundation Science and Technology Scholarship

境外生生活助學金

Bursary Award for Overseas Students

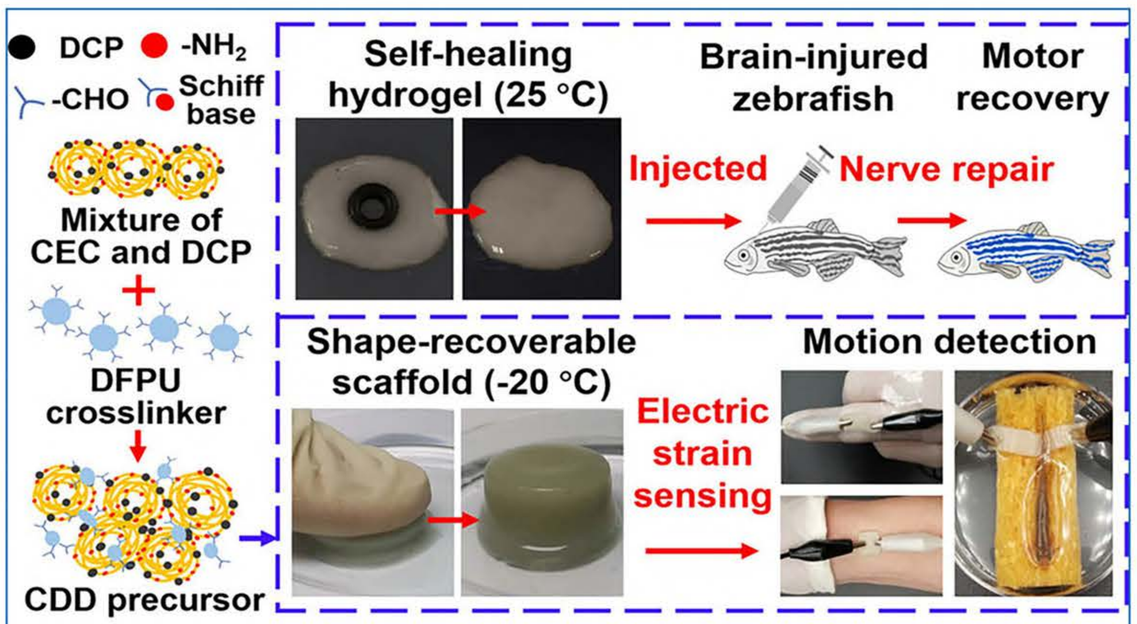
Development of chitosan-based conductive self-healing hydrogels and biomedical applications in neural system

Student: Junpeng Xu (Ph.D., graduate in July 2023)

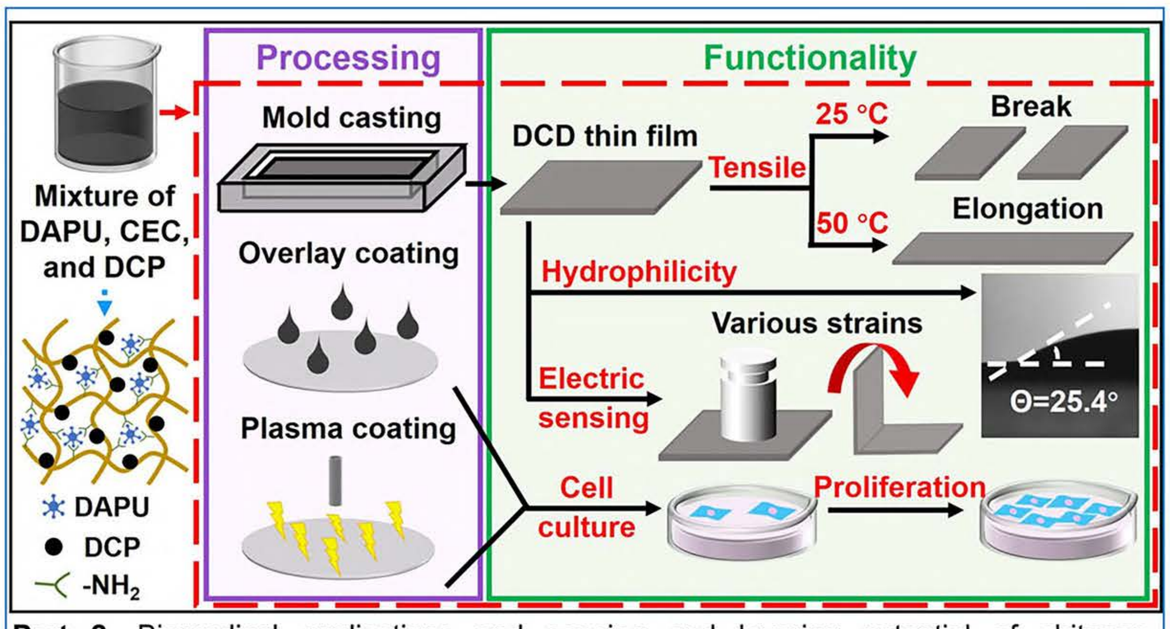
Supervisor: Prof. Shan-hui Hsu

國立臺灣大學 National Taiwan University Institute of Polymer Science and Engineering, National Taiwan University, Taipei, Taiwan, ROC

Brief summary Self-healing hydrogels based on chitosan have attracted much attention in the biomedical field over the past decades. These hydrogel networks are usually formed by dynamic Schiff base bonding between the amino groups of chitosan or its derivatives and the aldehyde groups of the crosslinker. Among the degradable self-healing hydrogels, conductive hydrogels are considered as a promising soft material due to their interaction with electroactive tissues, especially neural tissues. The conductivity of self-healing hydrogels for biomedical applications is often provided by conductive polymers or other metallic/non-metallic particles. However, different design strategies and material choices will impart various functions of conductive hydrogel to satisfy the intended application requirements.

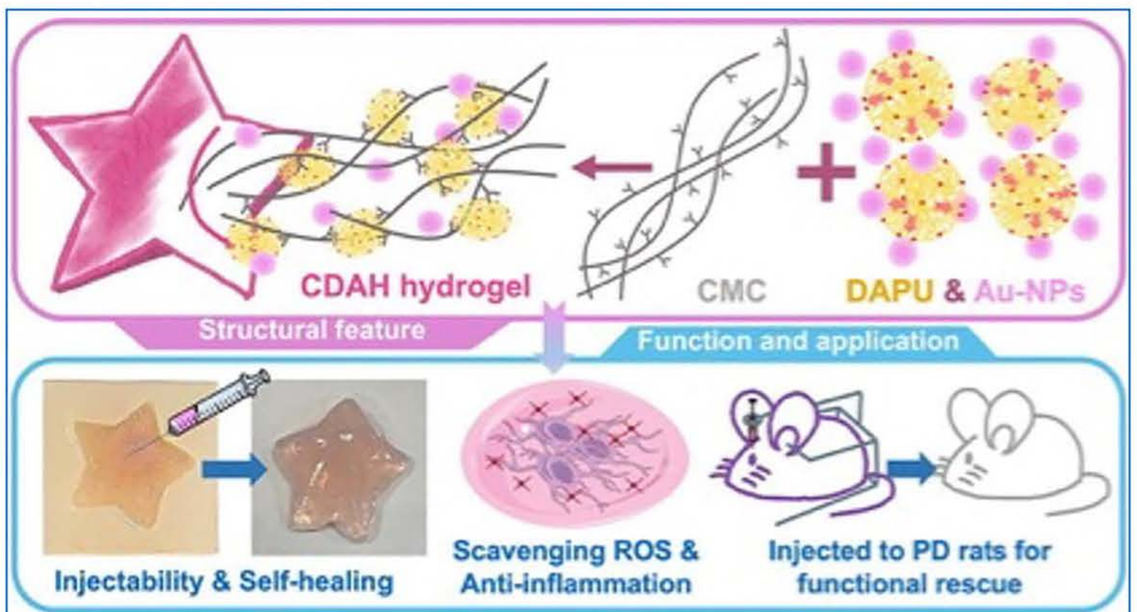


Part 1. Chitosan-polypyrrole nanoparticles combined with chitosan-polyurethane conductive gel/scaffold.

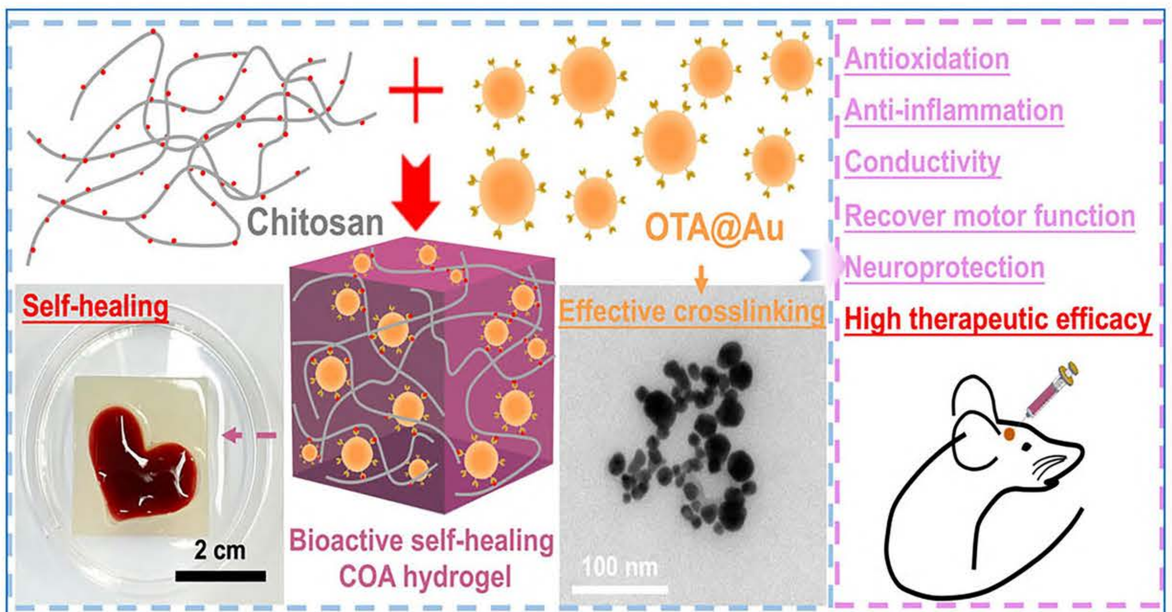


Part 2. Biomedical applications and sensing and layering potential of chitosan-polyurethane hydrophilic conductive composite films combined with conductive polymer nanoparticles.

Chitosan-based conductive self-healing hydrogels



Part 3. Potential therapeutic effects of anti-inflammatory chitosan-polyurethane conductive hydrogel combined with colloidal nanogold particles in neurological disorders.



Part 4. Synthesis of novel bioactive nanogold crosslinkers combined with chitosan to produce multifunctional conductive hydrogels for the treatment of Parkinson's disease.

Taken together, this study provides the suggestion to design chitosan-based conductive self-healing hydrogel for biomedical applications in neural system and presents the potential of utilizing chitosan-based conductive self-healing hydrogels as injectable implants for treating brain diseases as a promising strategy.