

#### Project summary:

Owing to the scarcity of fossil fuels, renewable energy sources have been developing to alleviate the problem. Among them, solar energy is deemed as the one with the highest potential. Dye-sensitized solar cell (DSSC) has the advantage of being low-cost and light weight. Silver nanoparticles (AgNPs) and gold nanoparticles (AuNPs) cathodic coatings are known to have catalytic properties on enhancing ionic movement in DSSC.

We report that cysteine-coated gold nanoparticles (Cys-AuNPs) cathodic coating exhibited a relatively higher and consistent current density to voltage ratio compared with cysteine-coated silver nanoparticles (Cys-AgNPs). As for mixtures of Cys-Ag/AuNPs, we found that AgNPs and AuNPs in 1:1 ratio for reaction with cysteine solution for 10 min is of the optimum condition. It showed a higher current density ( $6.36 \text{ mA cm}^{-2}$  at  $0.5 \text{ V}$ ) than others. Compared with reduced graphene oxide (rGO) as a solid support, polyaniline-supported AgNPs and AuNPs in 1:1 ratio immersed in Cys solution for 5 min achieved the highest current density to voltage ratio ( $15.8 \text{ mA cm}^{-2}$  at  $0.5 \text{ V}$ ). 1.23% efficiency was achieved by our invented DSSC.