The 4th SAMK-CCZU Research Forum

Electrosorption of lead ions by nitrogen-doped graphene aerogels via one-pot hydrothermal route

Prof. Yong Kong

School of Petrochemical Engineering, Changzhou University

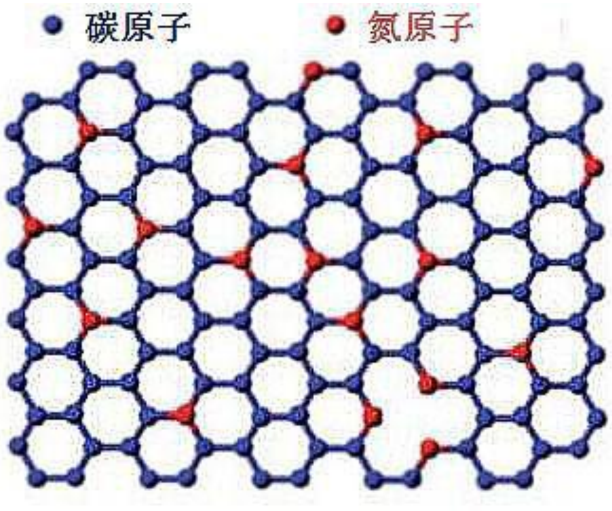
Email: yzkongyong@cczu.edu.cn

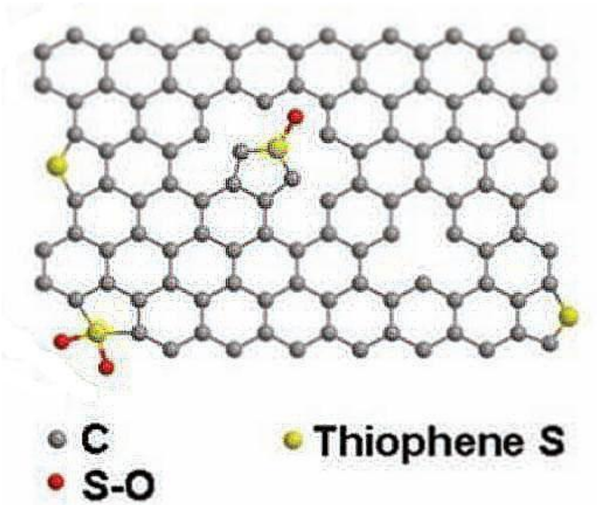
1. Introduction

A large amount of heavy metal ions is discharged into the environment, resulting in serious environmental pollution.

Carbon-based materials of porous structure, such as activated carbon, carbon nanotubes and carbon aerogels, have been used as electrode materials for electrosorption of heavy metal ions.

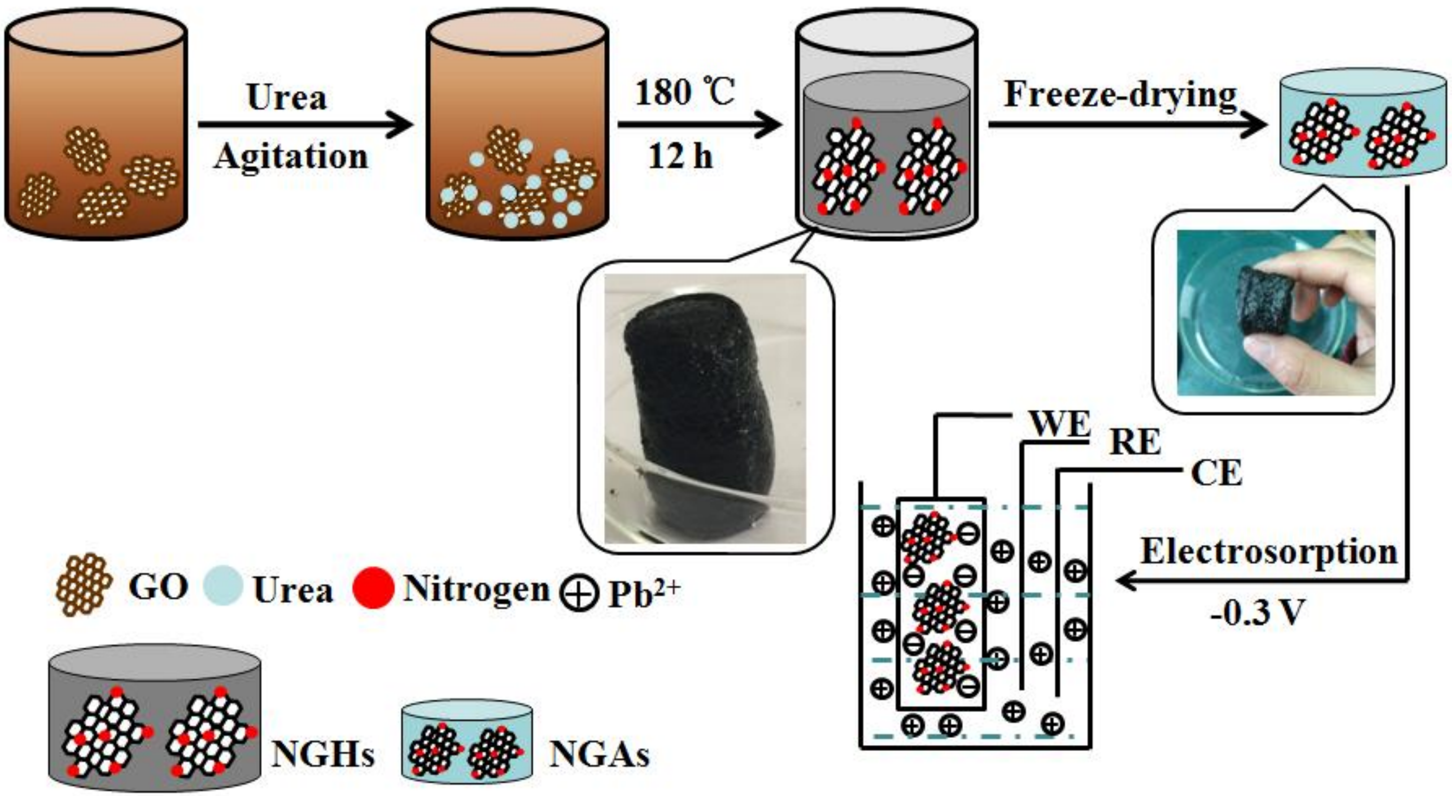
Introducing heteroatoms such as nitrogen atoms and sulfur atoms into solid adsorbents can enhance the adsorption capacity for heavy metal ions since the introduced heteroatoms can coordinate strongly with heavy metals.





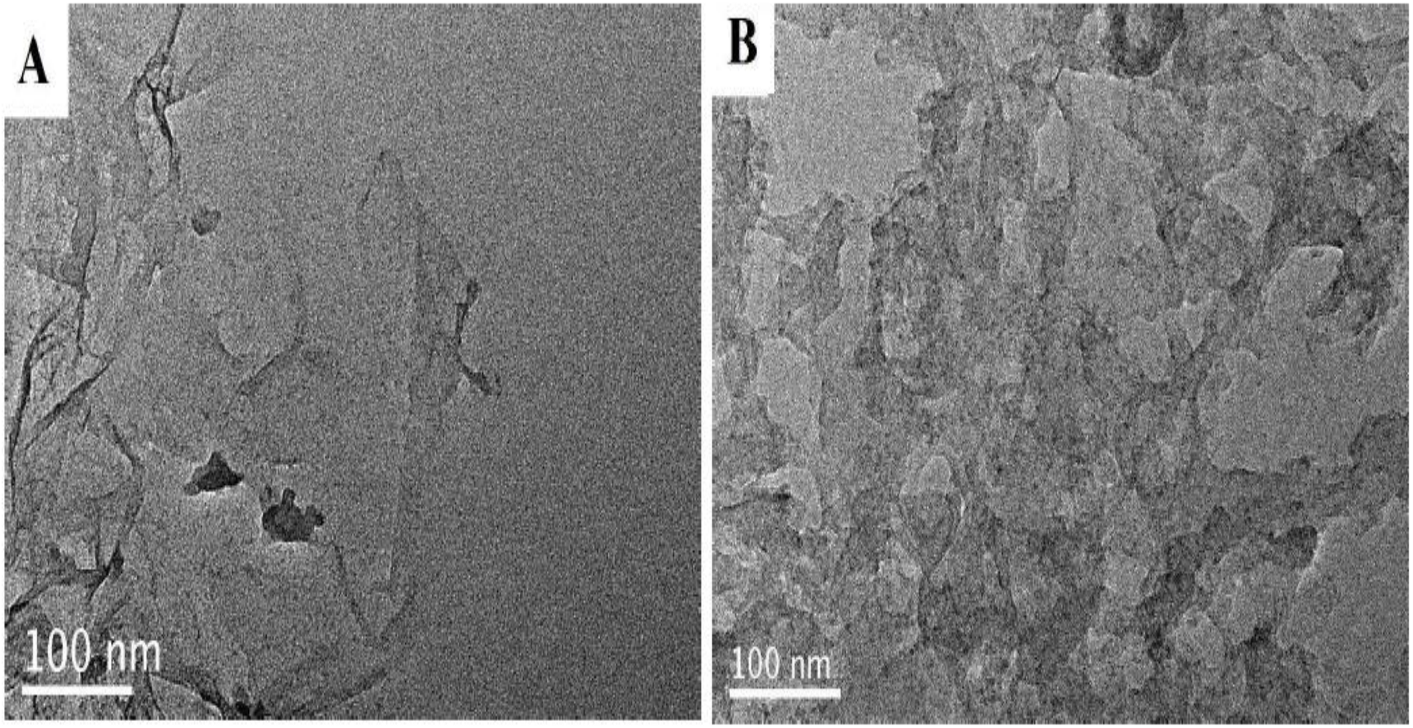
In the present work, nitrogen-doped graphene aerogels (NGAs) were prepared by one-pot hydrothermal synthesis of nitrogen-doped graphene hydrogels and followed by freeze-drying treatment. Pb^{2+} can be effectively removed by the as-prepared NGAs at an applied negative potential.

2. Experimental

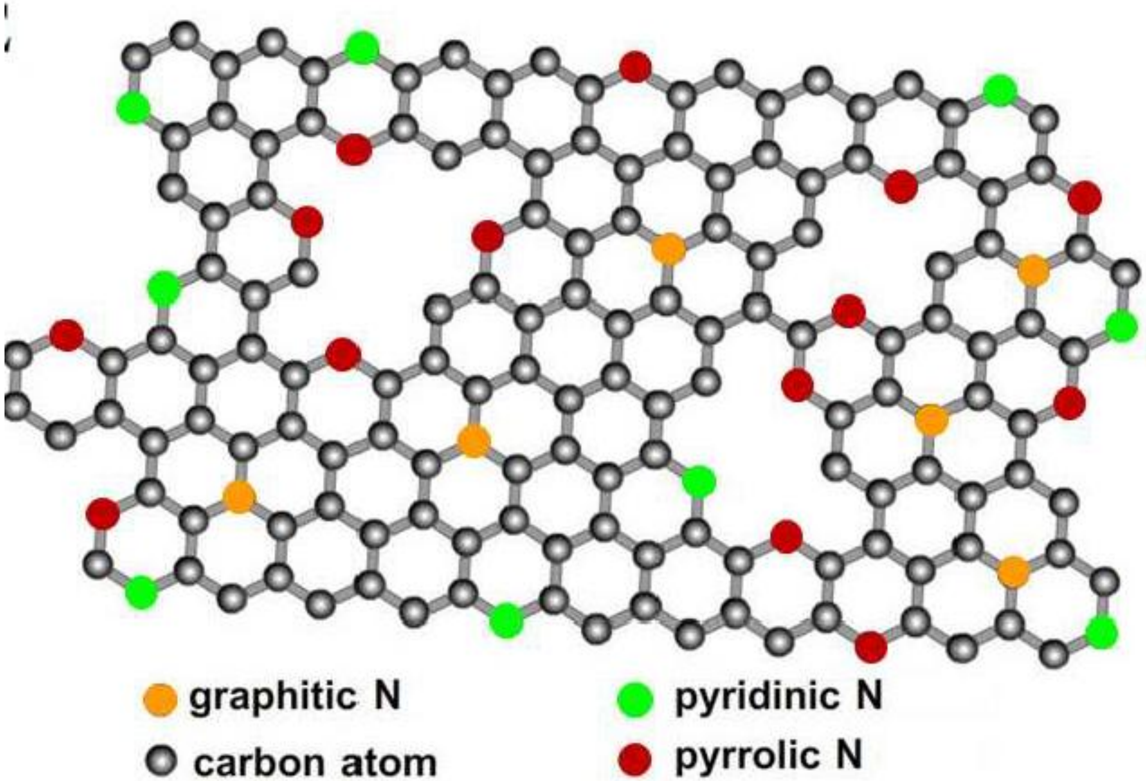


Schematic illustrating the whole process for NGAs synthesis and application in the electrosorption of Pb^{2+}.

3. Results and discussion



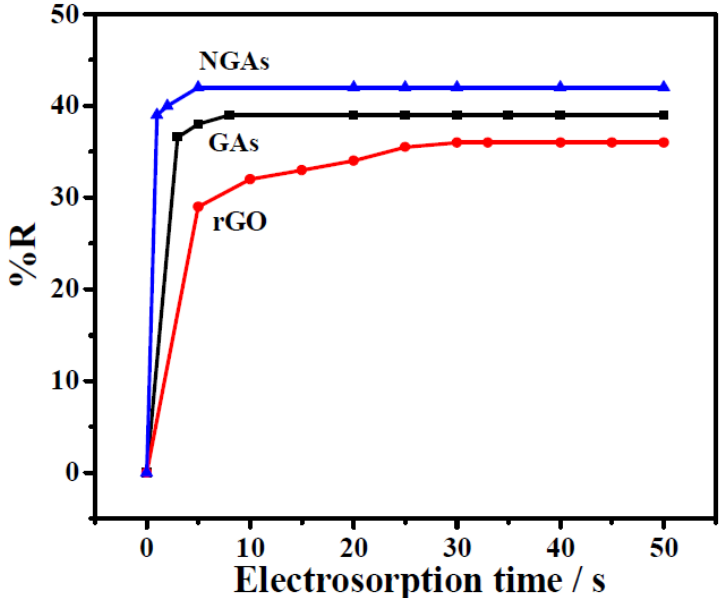
Low-resolution TEM images of GAs (A) and NGAs (B).



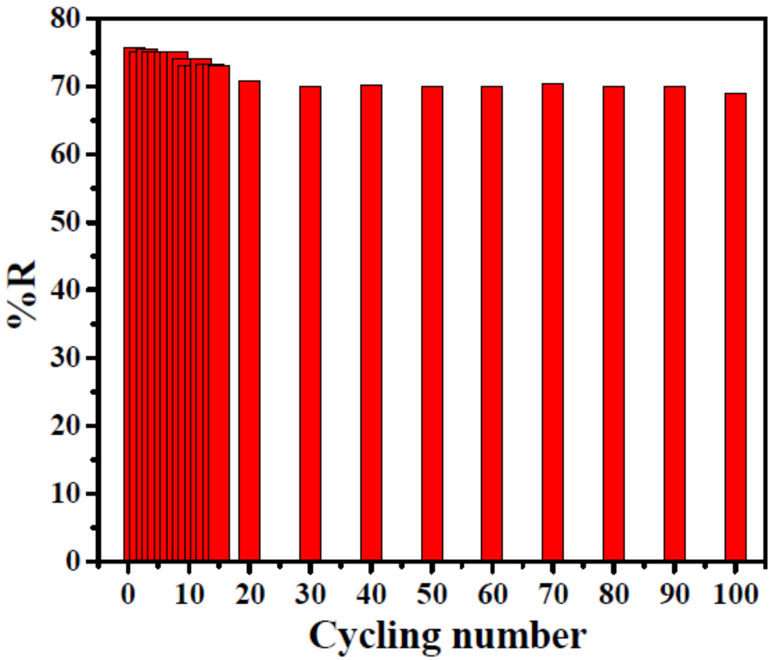
Schematic structure of NGAs with three types of doped nitrogen.

The 4th SAMK-CCZU Research Forum

The removal mechanisms on the NGAs electrode can be concluded as following: (1) electrostatic attraction derived from external electric field, (2) electrostatic attraction caused by intrinsic charges on NGAs and Pb^{2+}, (3) large surface area of NGAs, and (4) coordination between doped nitrogen atoms and Pb^{2+}.



Electrosorption of 1 mM Pb^{2+} on NGAs, GAs and rGO electrodes at an applied potential of –0.3V.



The amazing enhancement in the stability of the NGAs electrode is attributed to the excellent mechanical strength of NGAs possessing interconnected three dimensional porous networks generated by nitrogen doping.

Successive electrosorption/electro-desorption cycle for the treatment of 80 mL 0.2 mM Pb^{2+} at the same NGAs electrode at an applied potential of –0.3 V.

4. Conclusions

In summary, NGAs samples were synthesized *via* a facile one-pot hydrothermal synthesis of NGHs followed by freeze-drying treatment, and the resultant NGAs were used as the electrode material for the successful electrosorption of Pb^{2+} for the first time.

The 4th SAMK-CCZU Research Forum

Our group

Thank you for

your kind attention！