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Emerging Nanomaterials for Energy Conversion & Storage

Nawal Ashraf [a,b], Khurram Saleem Joya[c,*] and Zhixiang Wei [a,b,*]

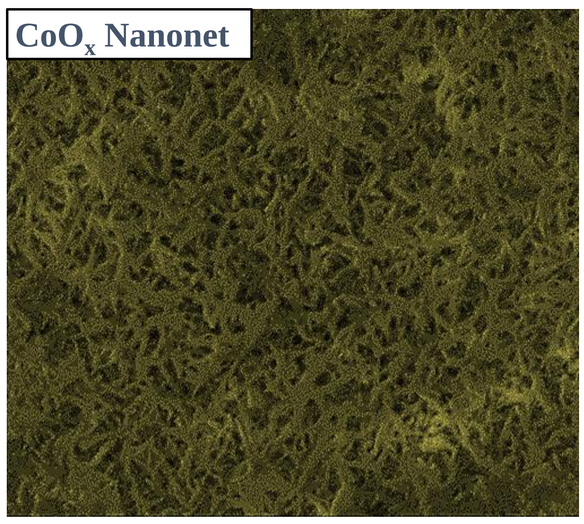
[a] *National Center for Nanoscience and Technology, Chinese Academy of Sciences, Haidian Qu, Beijing Shi, China, 100190.*

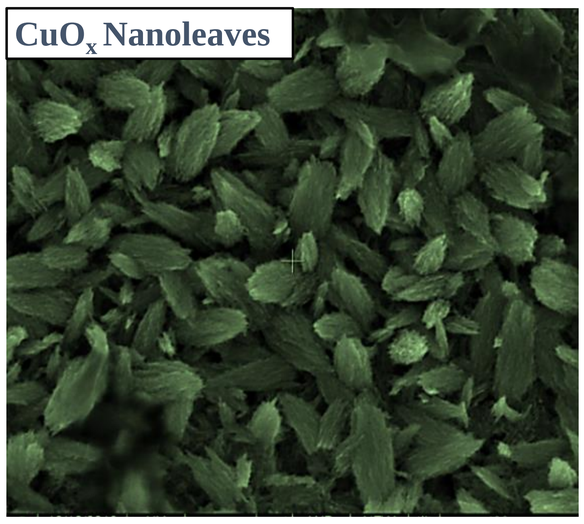
[b] *University of Chinese Academy of Sciences, No.19(A) Yuquan Road, Shijingshan District, Beijing, P.R. China 100049.*

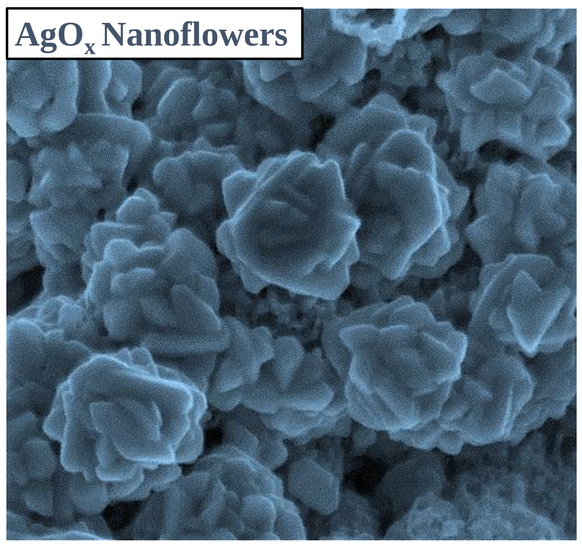
[c] *University of Engineering and Technology, Lahore, Pakistan.*

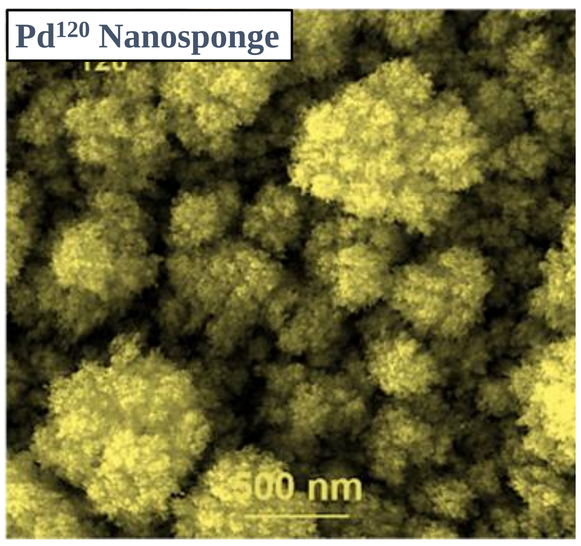
Introduction: *Recently, a dominant trend in the development of nanoscale materials with emphasis on energy conversion and storage systems has been fairly witnessed. Here we show a range of thin-film inorganic (electrocatalysts) and organic (carbonyl-based) materials, and their hybrid assemblies for electrochemical devices, presenting top performances. The metal-oxide electrocatalysts derived from CoO_x, CuO_x, AgO_x, IrO_x, metallic Pd and ZnTe exhibit remarkably low overpotentials for the onset of water oxidation, thus generating H_2 at a much lower energy cost. And, the carbonyl-based compounds on compositing with CNTs explicitly show high rate performances along with sufficiently long cyclic stability over 2000 – 30000 charge/discharge cycles.*

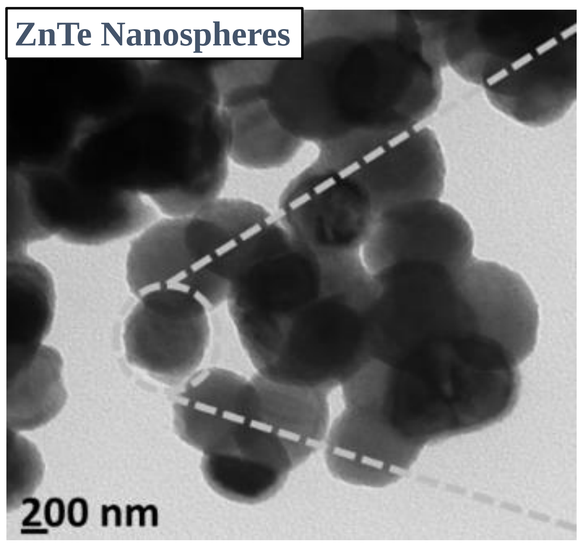
Energy Conversion

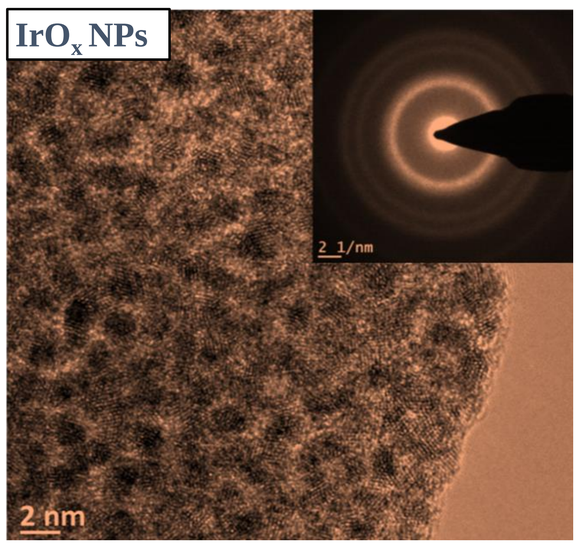


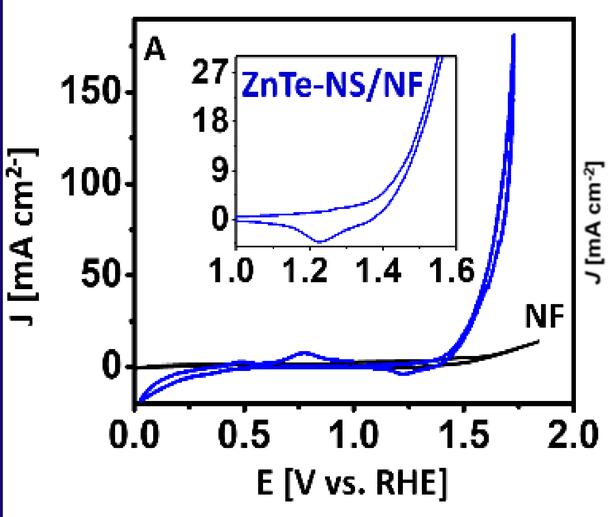


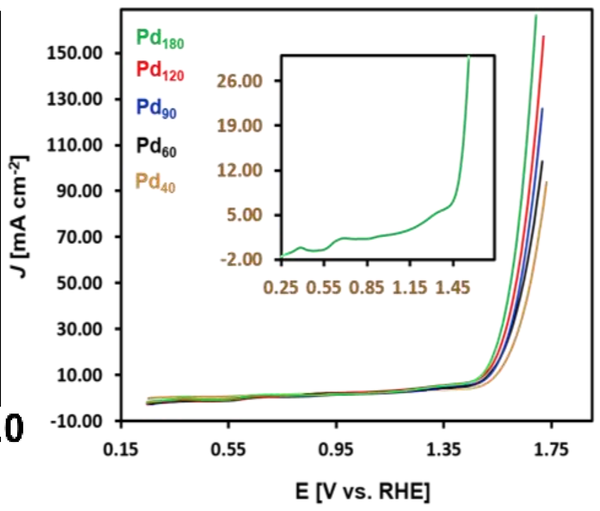




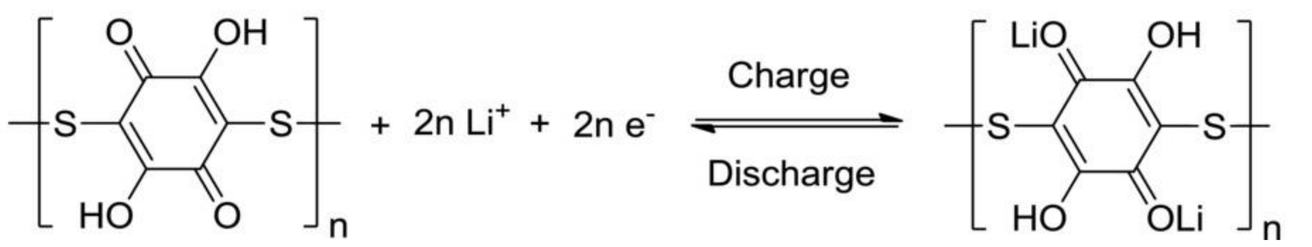


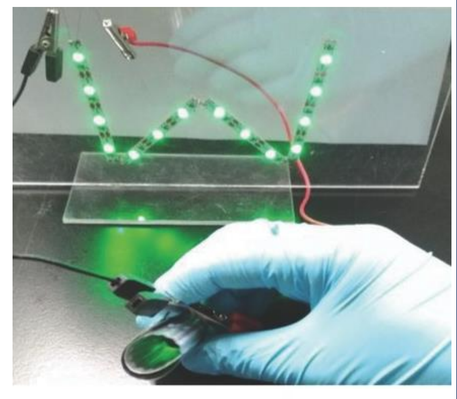


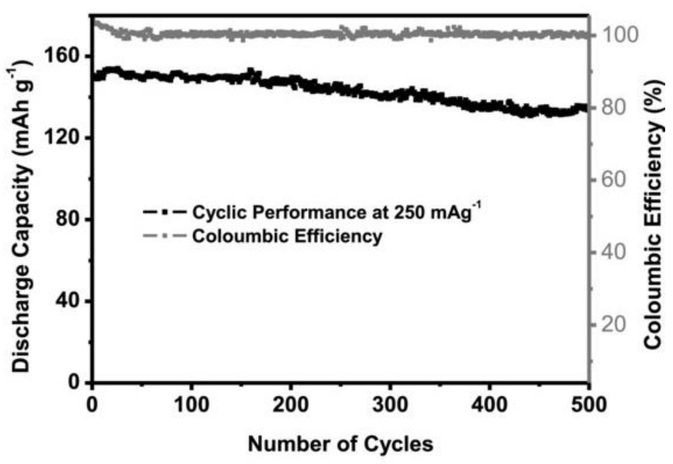


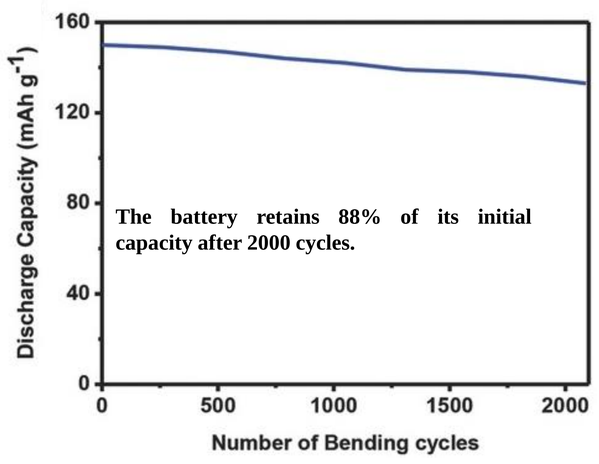


Energy Storage

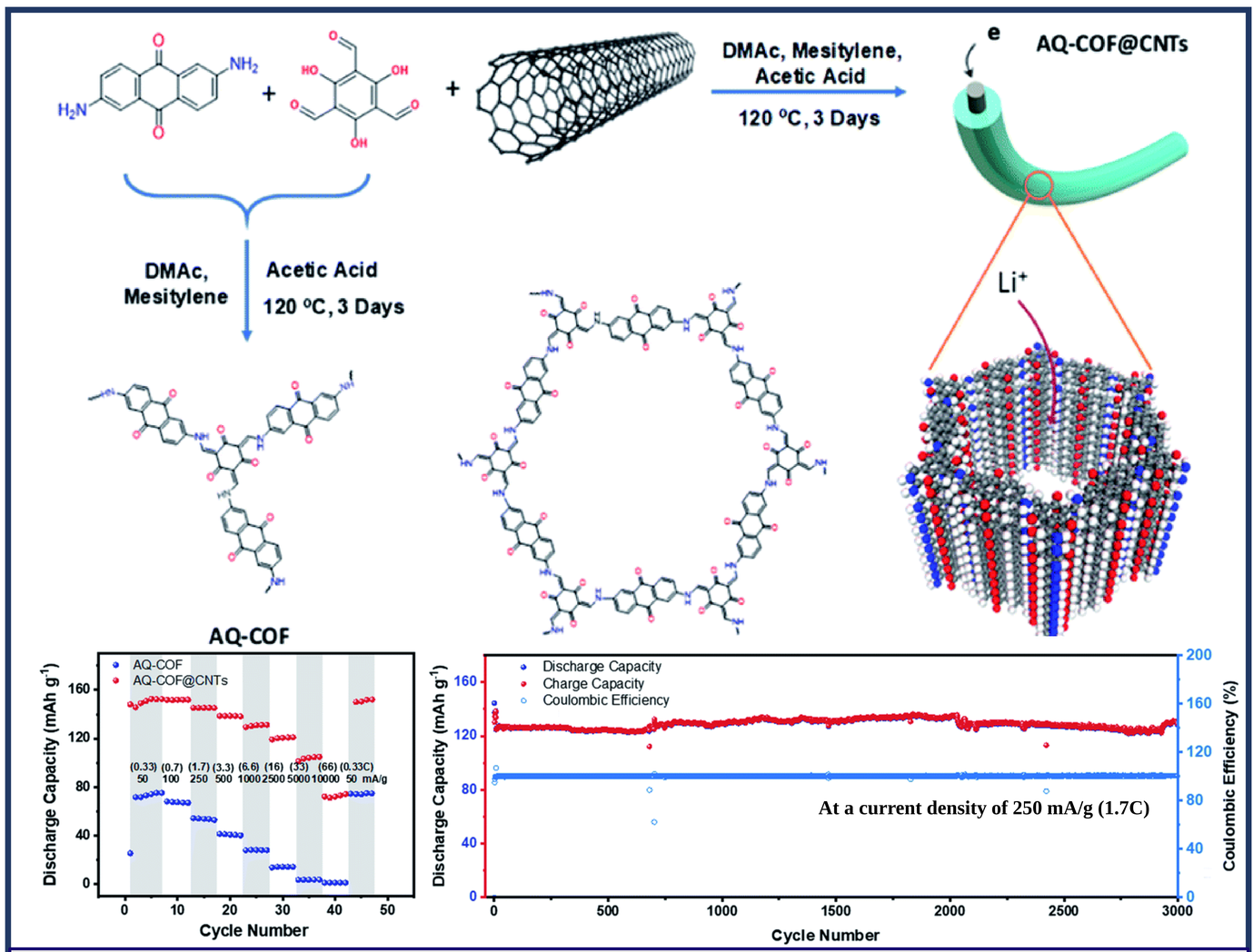








A sulfur-linked carbonyl-based poly(2,5-dihydroxyl-1,4-benzoquinonyl sulfide) (PDHBQS) compound was synthesized and used as cathode material for lithium-ion batteries (LIBs). Flexible binder-free composite cathode with single-wall carbon nanotubes (PDHBQS–SWCNTs) was then fabricated through vacuum filtration method with SWCNTs.



A surface-controlled pseudo-capacitive reaction mechanism for high-performance organic lithium ion batteries was developed, based on a coaxial nanocomposite of an active anthraquinone-based covalent organic framework (AQ-COF) and carbon nanotubes. (via in-situ polymerization)

References

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