Electronic Supplementary Material (ESI) for Nanoscale.

Carbon quantum dot/CuS_x nanocomposite towards high efficient lubrication and metal wear repair

Supporting Information

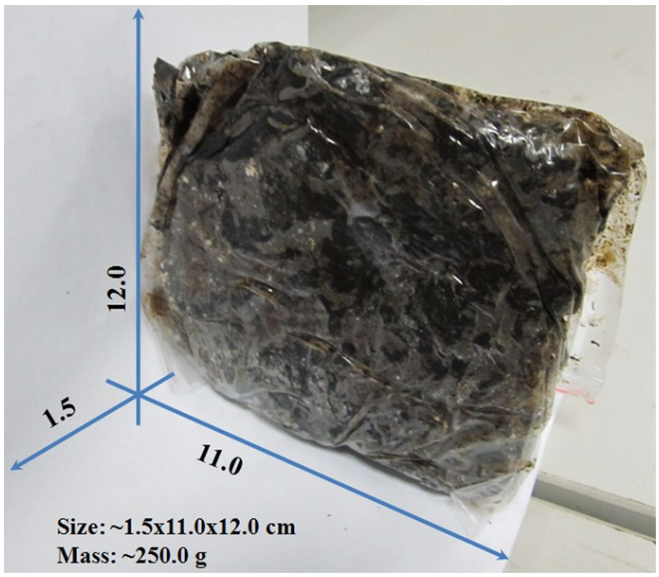

Figure S1. Photo image of figure for the mass preparation product (0.25 kg/h) of CQDs/CuS_x nanocomposites.

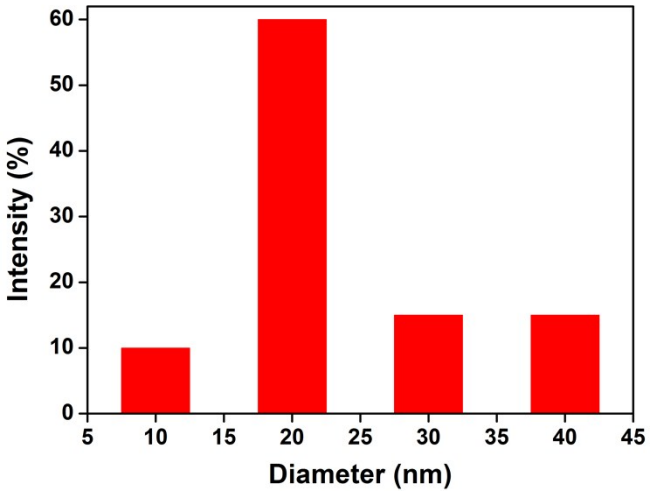

Figure S2. The size distribution of CQDs/CuS_x nanocomposites.

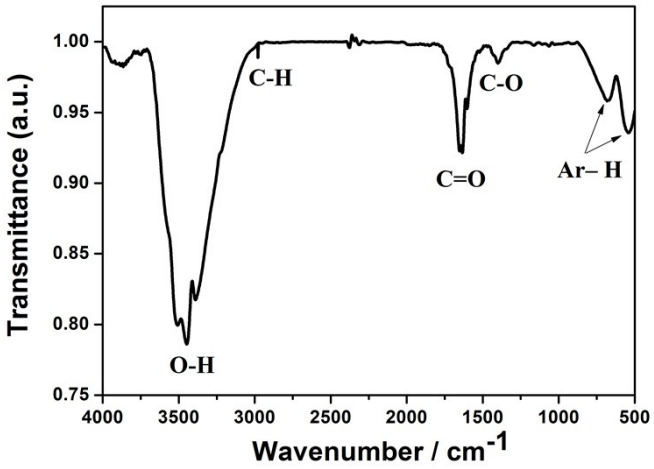

Figure S3. The FTIR spectrum of CQDs/CuS_x nanocomposites.

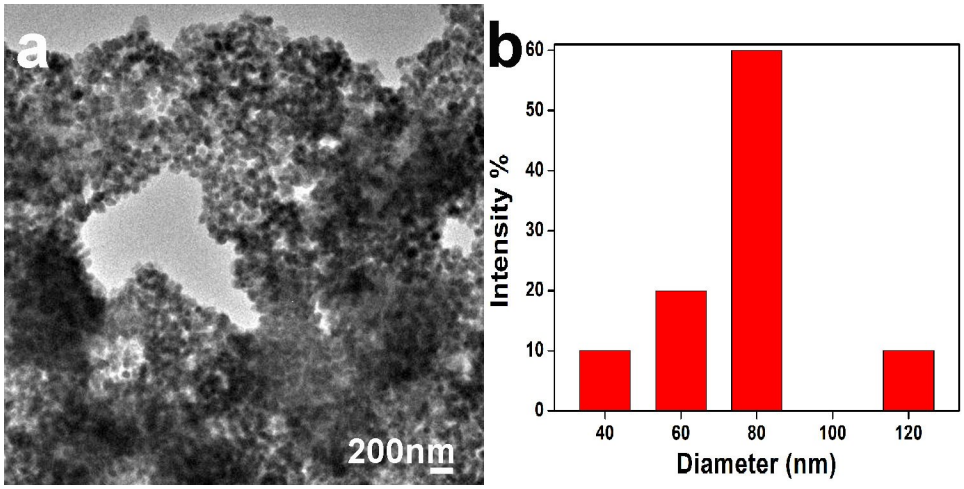

Figure S4. The TEM image (a) and size distribution (b) of CuS_x nanoparticles.

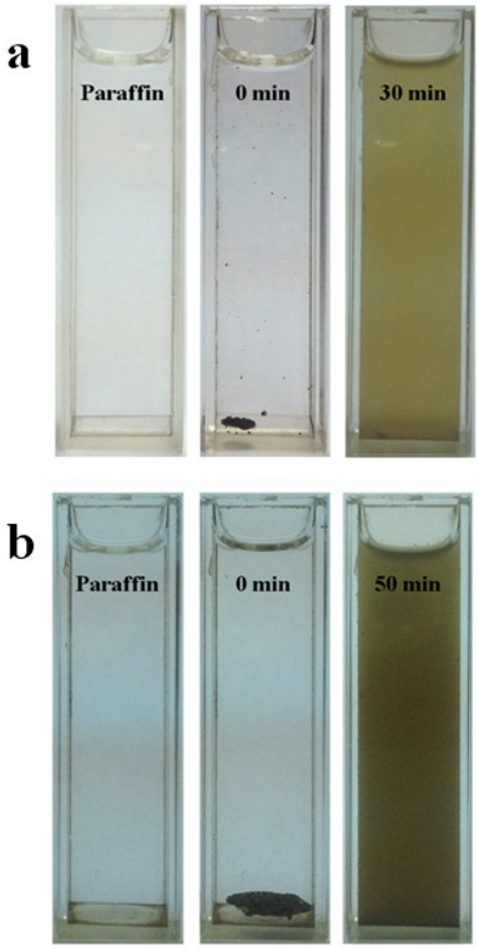

Figure S5. Photographs of CQDs/CuS_x soaked in liquid paraffin (a, 5.0 wt %; b, 10.0 wt %) at different time periods, showing the dissolution process.

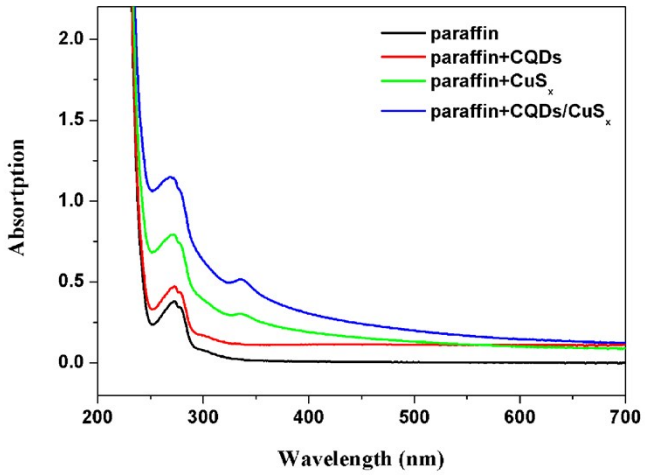

Figure S6. UV-Vis spectra of liquid paraffin with or without CQDs/CuS_x.

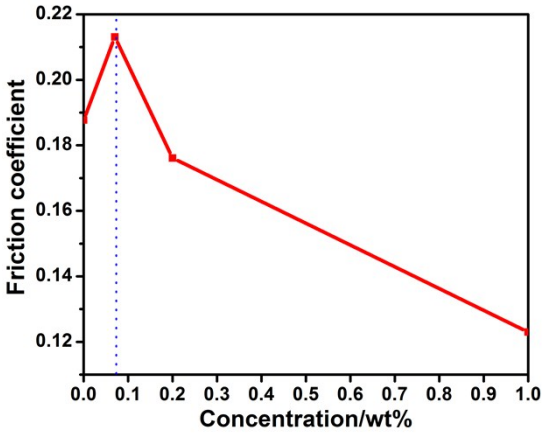

Figure S7. The amplified variation of friction coefficient with different contents (0-1.0) of CQDs/CuS_x nanocomposites in liquid paraffin.

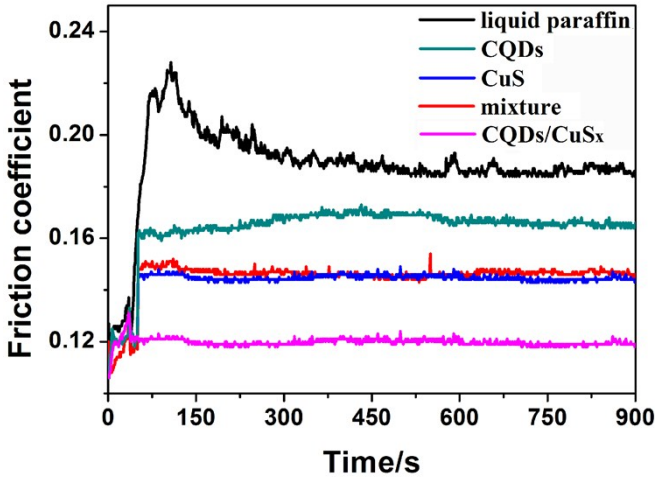

Figure S8. The effects of different components on antiwear abilities with liquid paraffin, CQDs, CuS, CQDs and CuS_x mixture, and CQDs/CuS_x nanocomposites as additives, respectively.

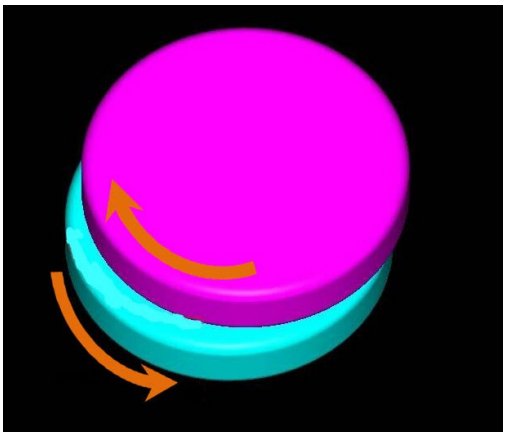

Figure S9. The designed device to understand the effect of CQDs/CuS_x nanocomposites on the lubrication and repair of worn surface behaviour. Stainless steel 304L is used as frictional couple.

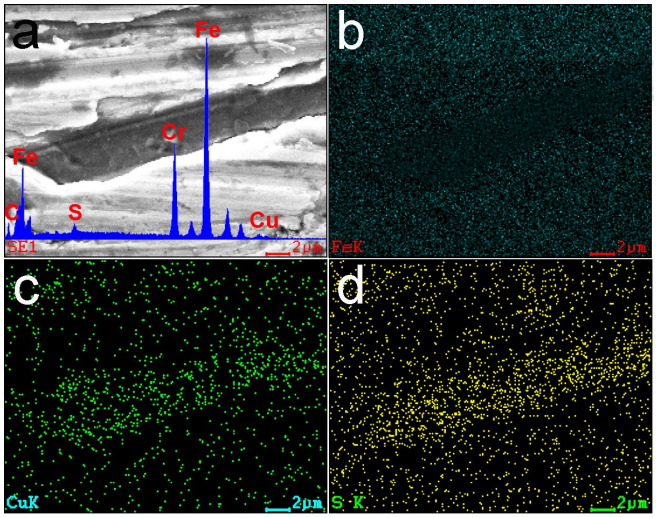

Figure S10. (a) SEM image of CQDs/CuS_x nanocomposites on the repair of worn surface and the corresponding EDS elemental mapping images of (b) Fe, (c) Cu and (d) S.

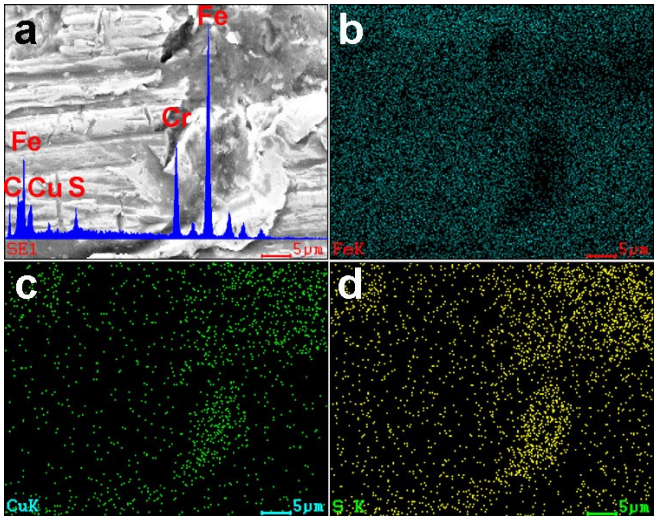

Figure S11. (a) SEM image of CQDs/CuS_x nanocomposites on the repair of worn surface and the corresponding EDS elemental mapping images of (b) Fe, (c) Cu and (d) S.

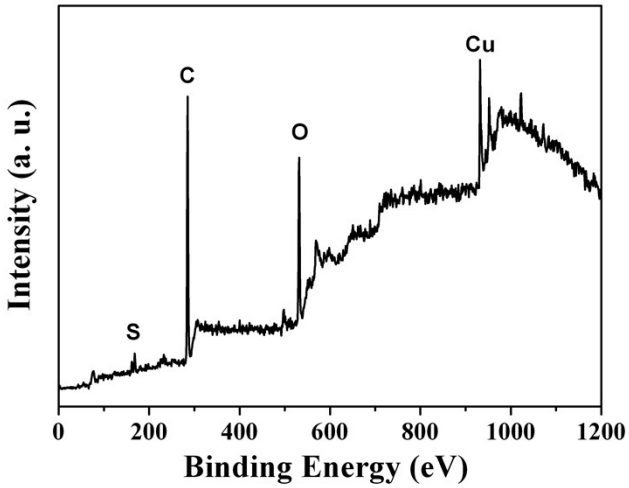

Figure S12. Typical full-survey XPS spectrum of CQDs/CuS_x nanocomposites on repair of worn surface.

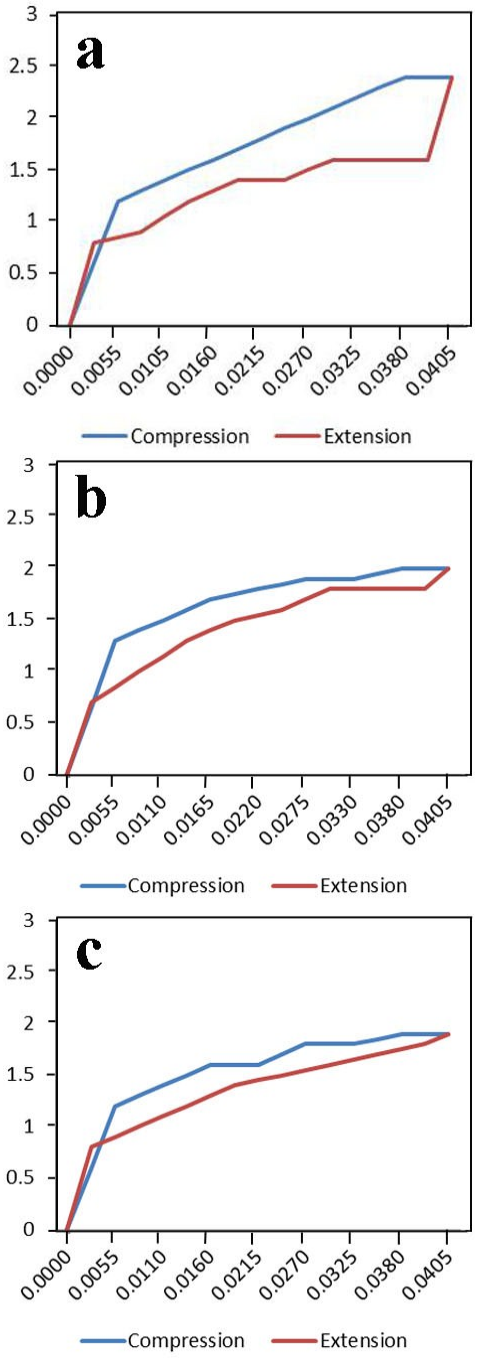

Figure S13. The friction coefficient without CQDs/CuS_x nanocomposites (a), with (b) and after insertions 1000 times (c) under compression and extension.

Figure S14. The variation of automobile exhaust after using CQDs/CuS_x nanocomposites as additive.