Electronic Supplementary Material (ESI) for CrystEngComm


# Fabrication of ZnO/CdS/$Cu_2ZnSnS_4$ *pn* heterostructure nanorod arrays via a solution-based route

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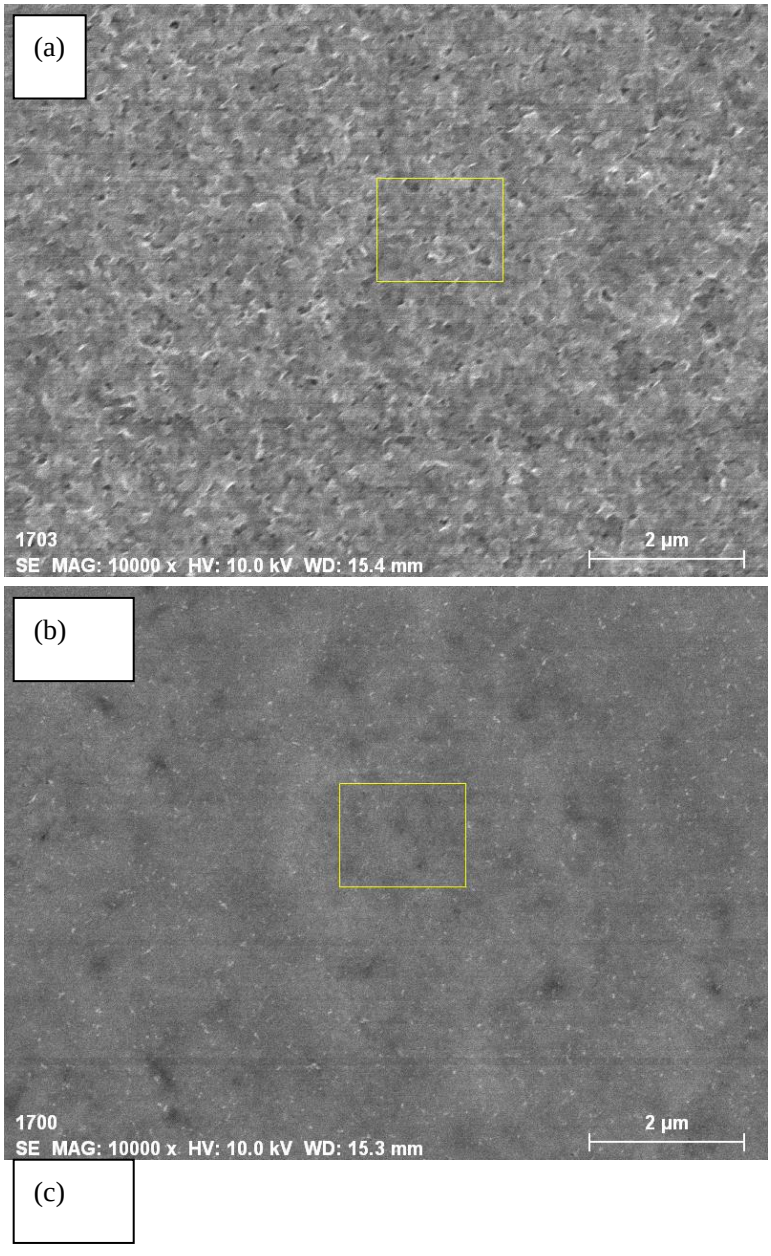
With regards to annealing temperature, we found the optimized temperature of formation of higher quality CZTS thin film is 420$^{o}$C during the other experimentals(see Fig. S1 and Fig. S2). Therefore we select 420$^{o}$C as annealing temperature.



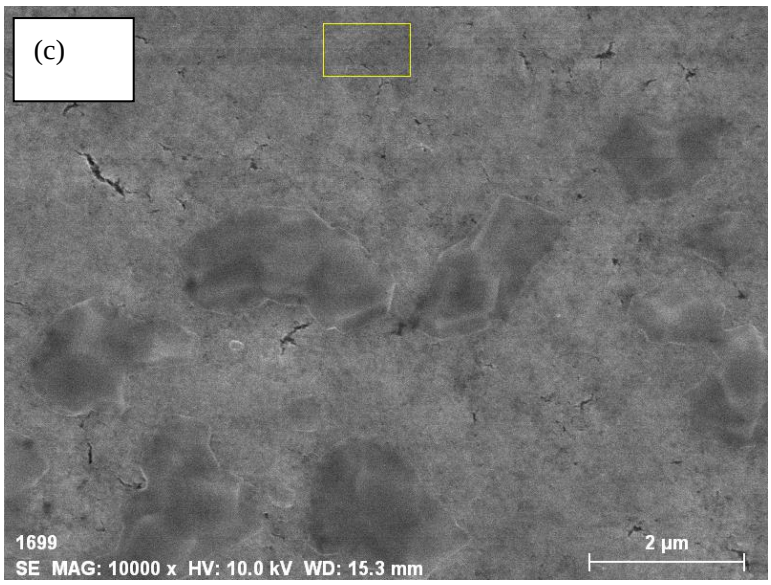



**Fig. S1** SEM images of CZTS thin fim annealing at: (a) 380°C, (b) 420°C and (c) 440°C

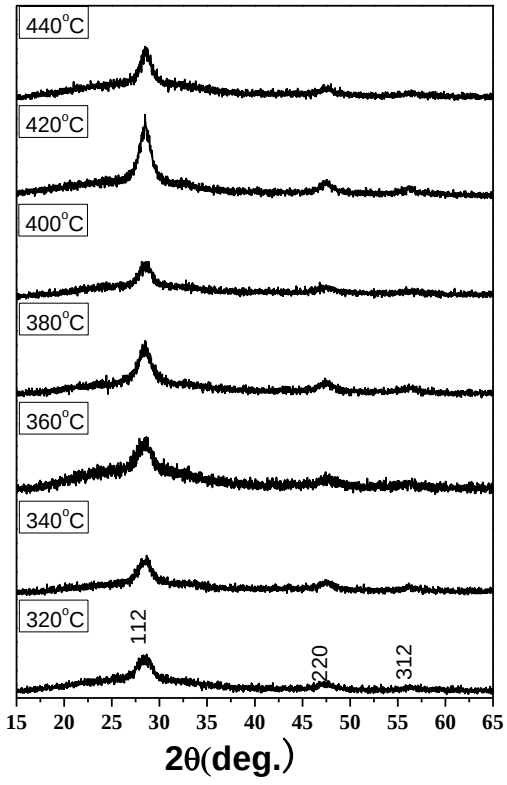



**Fig. S2** XRD patterns of CZTS thin film annealing at different annealing temperature.

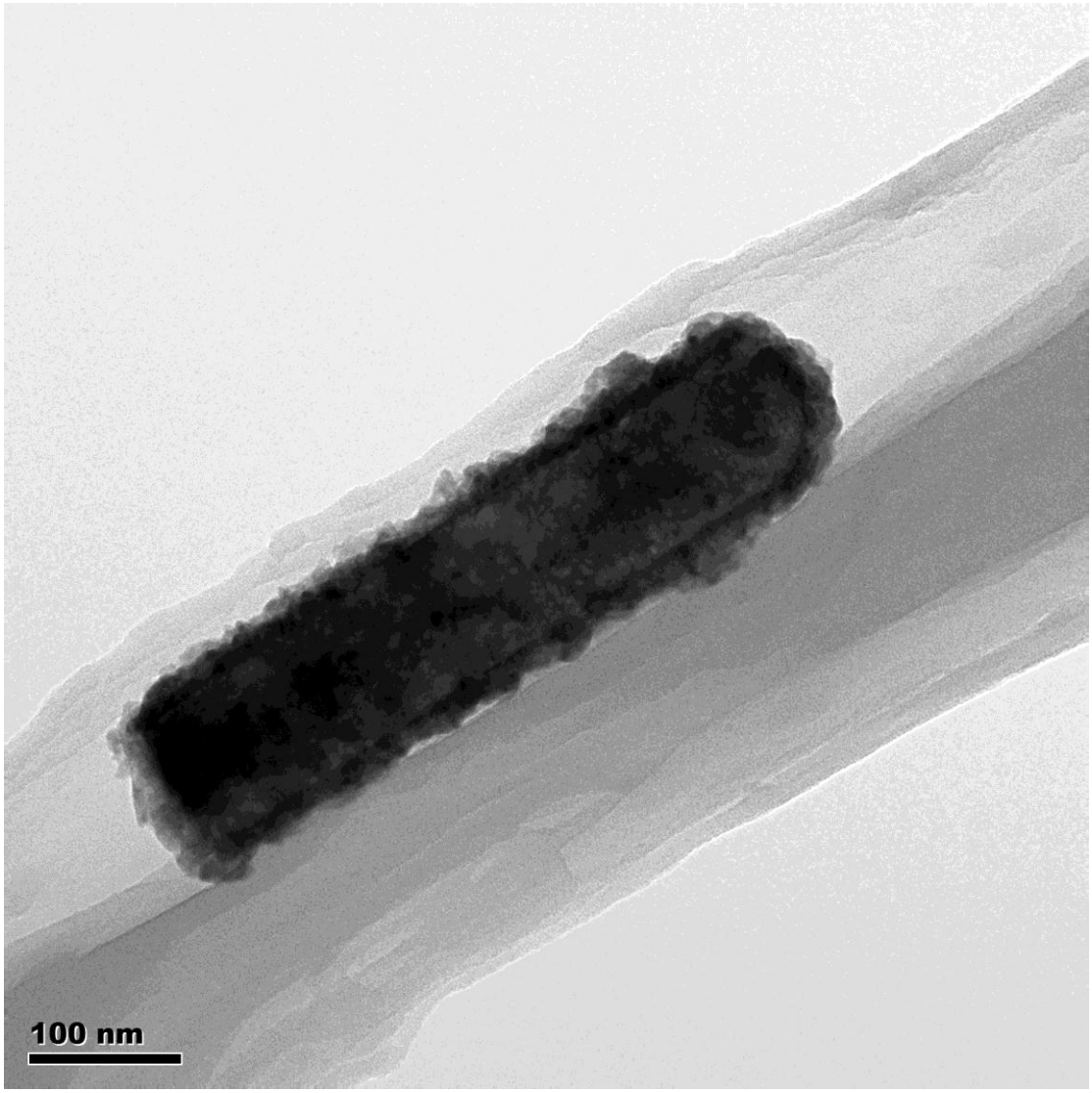



**Fig. S3** TEM image of ZnO/CdS/CZTS nanorod. It can be seen that CZTS nanostructures grown on the ZnO/CdS core-sheath nanorod.