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## Supporting information

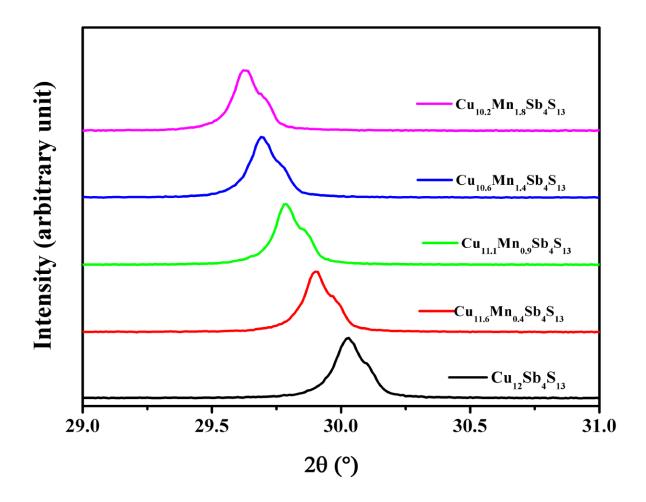


Figure S1. Maximum intensity peak of all the samples related to the (222) plane.

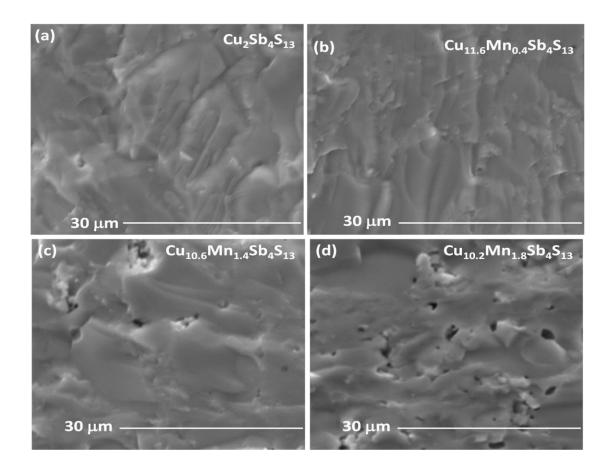


Figure S2. (a-d) secondary electron SEM images for  $Cu_{12-x}Mn_{1-x}Sb_4S_{13}$  (x = 0, 0.4, 1.4, 1.8).

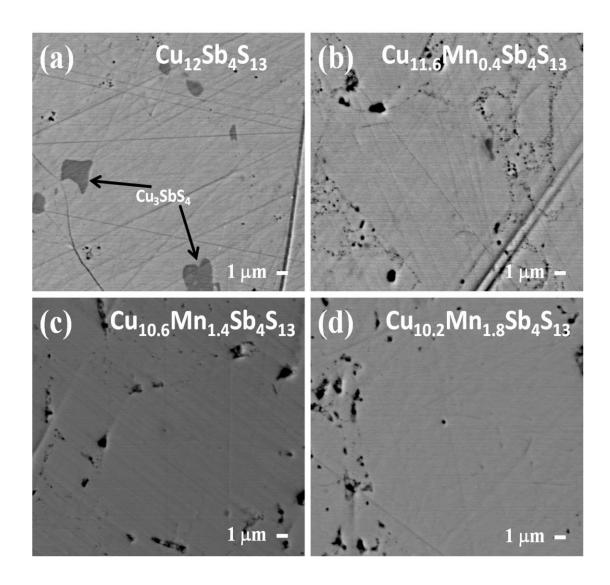


Figure S3. (a-d) Back scatter electron micrographs for  $Cu_{12-x}Mn_{1-x}Sb_4S_{13}$  (x = 0, 0.4, 1.4, 1.8).