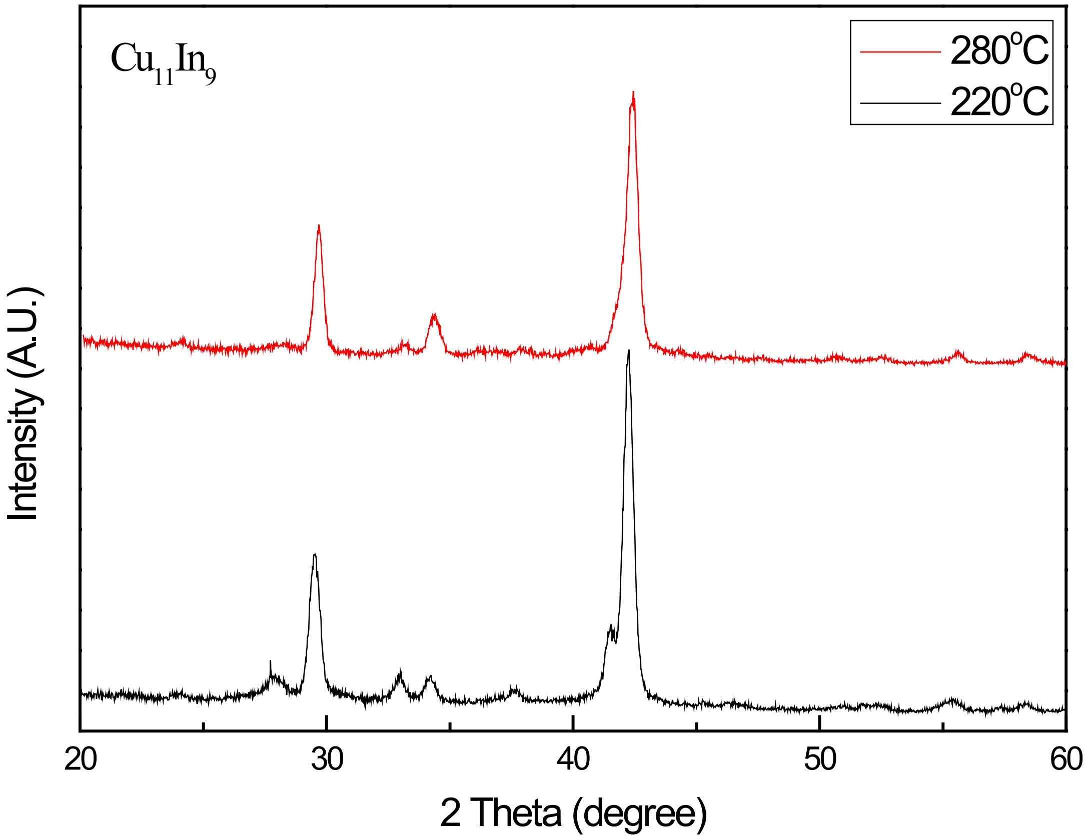


Fig. S1. GIXRD spectra of Type A samples annealed at 220 ℃ and 280 ℃

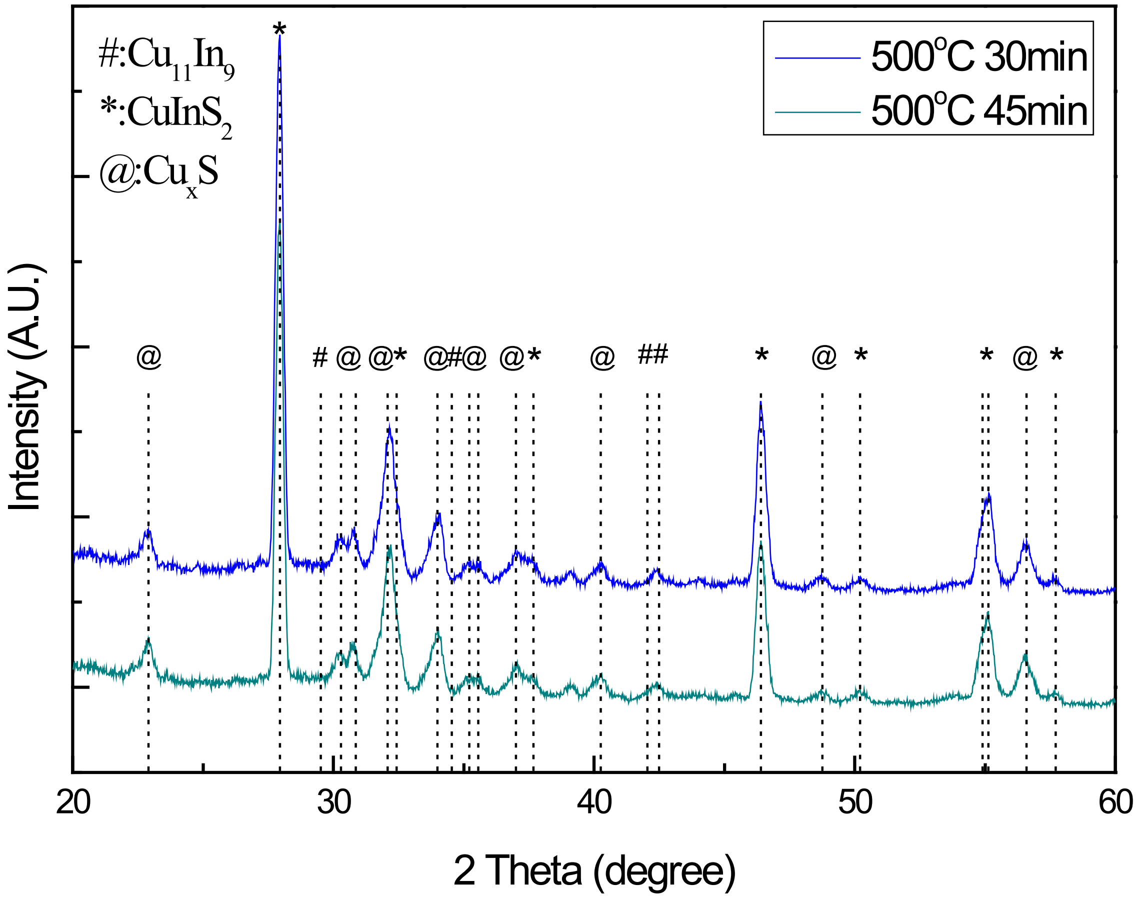


Fig. S2. GIXRD spectra of 500 ℃-30 and -45 min sulfurized Type A samples.

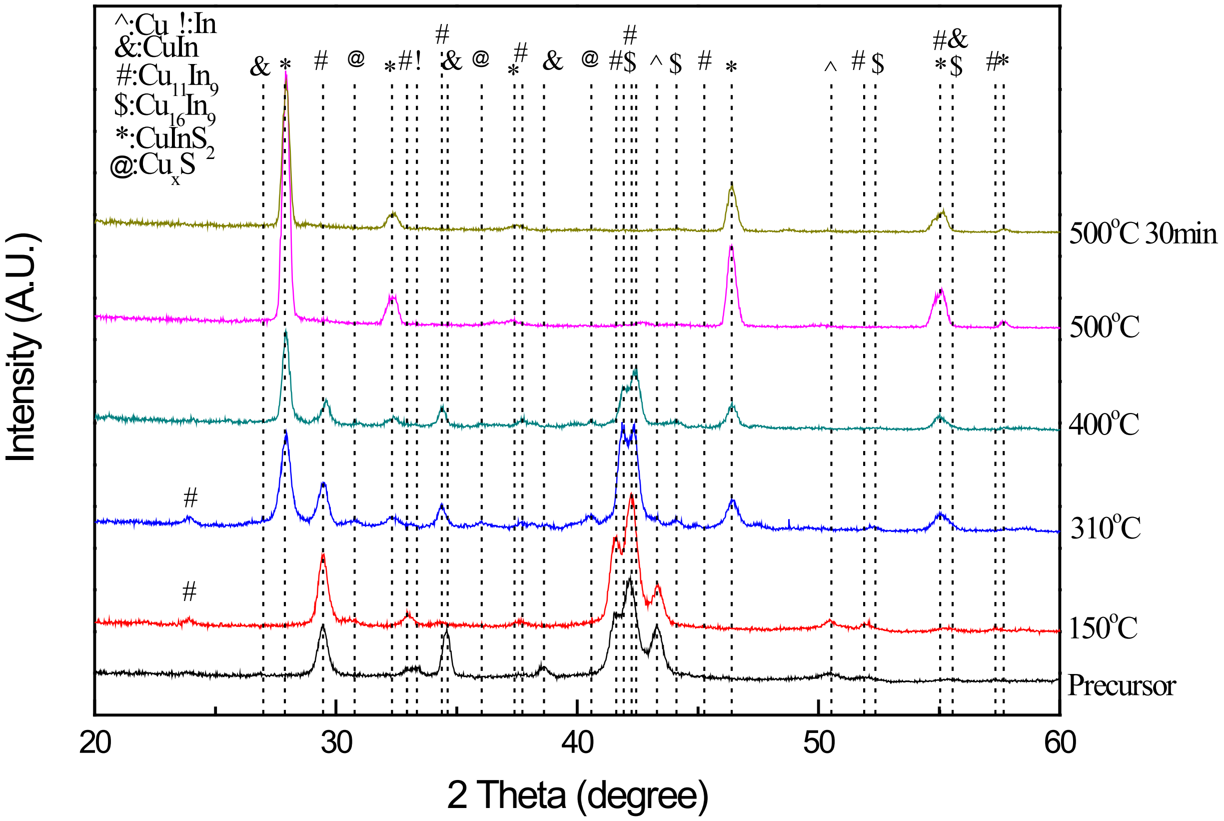
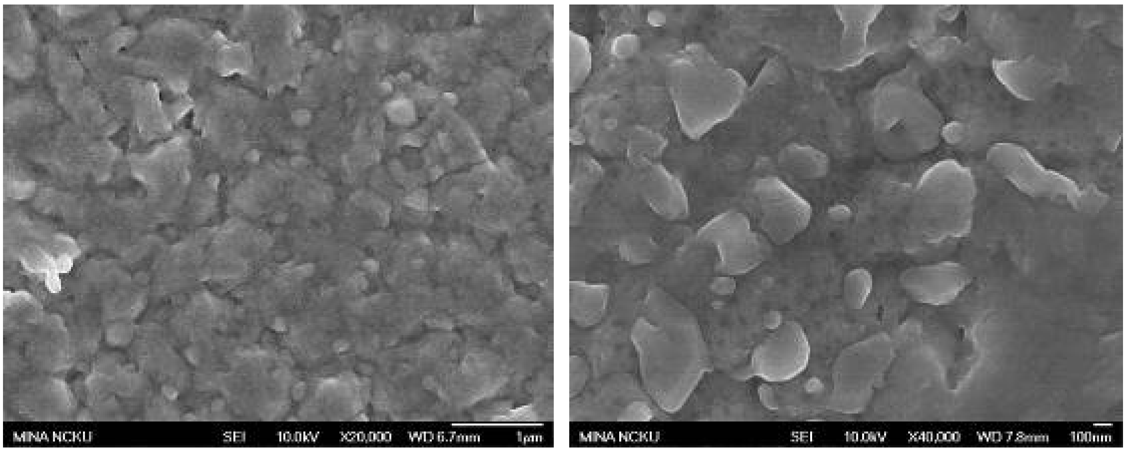


Fig. S3. GIXRD spectra of sulfurized Type-C precursor (Mo/In/Cu) films at various temperatures.



(A) (B)

Fig. S4. SEM image top views of (A) Type B sample annealed at 150 ℃ (B) Type C sample annealed at 160 ℃.

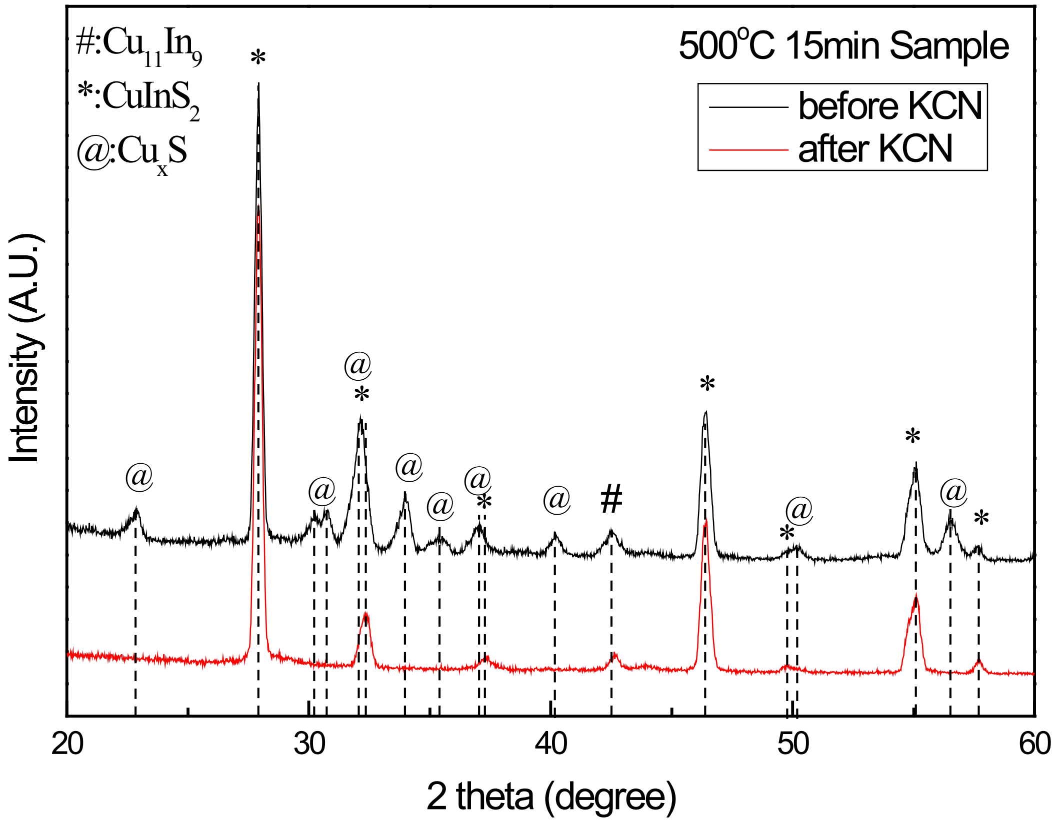


Fig. S5. GIXRD spectra of 500℃, 15-min sulfurized Type A sample before and after KCN treatment.

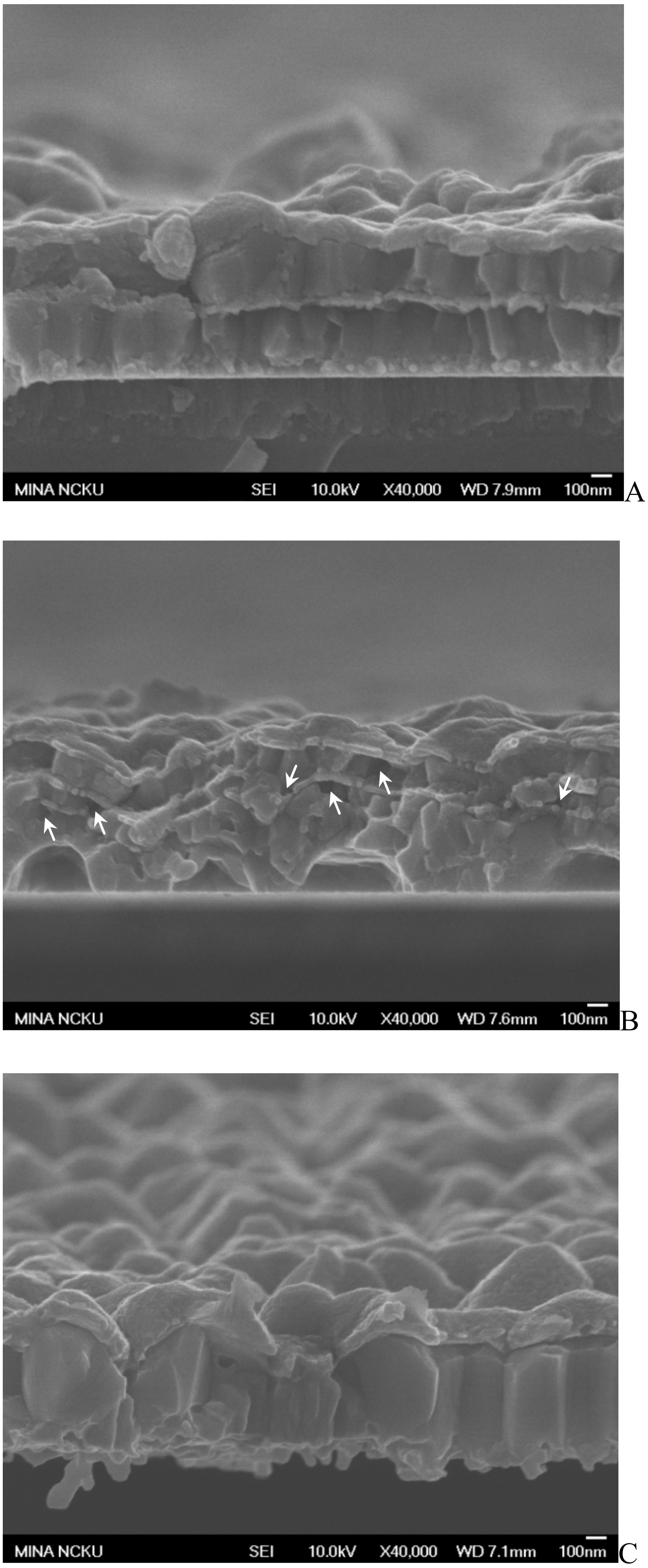


Fig. S6. Cross sectional images of as-deposited films of Type (A) A, (B) B, and (C) C.