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Effect of long selenization time on Co films under a low temperature of 300 ˚C to synthesize a nanostructure $CoSe_2$ and optical properties

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This work investigates a simple method to transform pre-deposited amorphous Co film into $CoSe_2$ films at a fixed, low temperature of 300 °C. Single $CoSe_2$-phase films having good crystallinity were obtained at a selenisation time ≧ 24 hours. A nanostructure $CoSe_2$ having two different nano-morphological layers was observed. The $CoSe_2$ films (72 hours) observed a large absorption and a direct band gap.

Transition metal chalcogenides/dichalcogenides MX_2 (M = Mn, Fe, , Ni, Co; X = S, Se, Te) has been investigated on their optical, magnetic, and electrical properties. Many theoretical and experimental reports have been done on the pyrites MX_2. Due to the application in, rechargeable battery electrodes and their potential applications in such areas as spintronic devices pyrites MX_2. $CoSe_2$ and CoSe have received increasing appeal as potential cathodic catalysts for fuel cells. Fuel cells can directly reduce our dependence on oil, energy use, and harmful emissions, which are used for stationary, portable power, and transportation. In the other hand, the oxygen reduction reaction (ORR), used in an acid medium Pt-based material, is the best and most used catalyst. However, Pt materials are too expensive, while Fe and Co metals are much cheaper and serve equally as potential catalytic centers towards ORR in the creation of solar cell material. The cathodic oxygen reduction in chalcogenides of various transition metals has been further reported.

Key words: Nanostructure, Selenisation, Transition metal dichalcogenides