Ar mangāna un vara joniem aktivētā cinka sulfīda nanomateriālu sintēze

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Cinka sulfīds ir nozīmīgs II-IV tipa pusvadītājs ar pietiekami platu aizliegtās zonas platumu (~ 3,7 eV) [1]. Aktivēti ZnS nanomateriāli ir plaši izmantojami tādās optoelektroniskajās ierīcēs kā elektroluminscentajās ierīcēs luminofora slāņa veidā, gaismu emitejošās diodēs, gaismu absorbējošā slānī saules panēļos. [2] Nesen ir augusi interese pret caurspīdīgiem aktivētiem ZnS plāniem pārklājumiem. [3]
Darbā gaitā tika sintezēti nekativēti, ar mangānu un ar varu aktivēti (0,5; 1,0 ; 1,5; 2,0 at%) ZnS nanomateriāli pēc solvotermālās, mikroviļņu asistētās solvotermālās, sol-gel metodes, kurus tiek paredzēts turpmāk uzklāt caurspīdīgo plāno kārtiņu veidā uz stikla substrātiem ar indija-alvas oksīda pārklājumu ar lazerpūtināšanas metodi. Sintēzi veica etilēnglikola un dejonizētā ūdens sistēmās. Kā cinka avoti tika izmantoti cinka hlorīds, cinka acetāts, bet kā sēra avoti izmantoja nātrija sulfīda nonahidrātu un tiourīnvielu.
Sintēzēto paraugu elementu sastāvu noteica ar enerģijas dispersīvo rentgenstaru spektroskopiju, savukārt struktūru un morfoloģisko īpašību noteikšanai tika izmantota rentgenstaru difraktometrija un skenējošā elektronu mikroskopija. Optisko īpašību raksturošanai izmantota fotoluminiscences spektroskopija.

Synthesis of manganese and copper doped zinc sulfide nanomaterials

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Zinc sulfide is an important II-IV type semiconductor with a relatively wide band-gap (~ 3,7 eV) [1]. Doped ZnS nanomaterials are commonly implemented for designing a variety of optoelectronic devices such as phosphor layers in thin film electroluminescent displays, light-emitting diodes, light-absorbing layers in solar panels. [2] Recently, the deposition of transparent doped ZnS thin films has gained much attention. [3]
The present work involved the synthesis of undoped, manganese-doped an copper-doped (0,5; 1,0; 1,5; 2,0 at%) ZnS nanomaterials by solvothermal, microwave assisted solvothermal and sol-gel methods for further deposition of transparent thin films on indium-tin oxide coated glass substrate by pulsed laser method.The reactions were carried out in ethylene glycol and dionized water media. Zinc chloride and zinc acetate were used as zinc sources, and sodium sulfide nonahydrate and thiourea were used as sulphur sources.
The elemental content of ZnS synthesis products was studied by energy-dispersive X-ray spectroscopy, while the structure and morphology were determined by X-ray powder diffraction and scanning electron microscopy. Optical properties were studied by photoluminescence spectroscopy. Based on the experimental results the impact of dopant concentration on the optical properties of ZnS is discussed.

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