

POSTER PRESENTATIONS

Topics related to Chemistry

(TRC)





Production and characterization of $K_{0.3}MoO_3$ thin films

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Thin films,
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Abstract: We present the influence of production parameters (substrate temperature T_s and partial oxygen pressure p_{O_2}) on granular $K_{0.3}MoO_3$ (potassium blue bronze) thin films produced by pulsed laser deposition (PLD) and analyzed by various standard techniques such as UV-vis spectroscopy, TOF-ERDA, XRD, AFM, SEM, femtosecond-Time Resolved spectroscopy (fs-TRs) and electrical transport.

In general, $K_{0.3}MoO_3$ represents a prototype of a quasi-one-dimensional (q-1D) material which exhibits transition to a collective, charge density wave state (CDW) below transition temperature T_p . Its properties are well known and described in crystal, but because of reduced dimensionality, CDW films enable a study of physical properties of these systems on meso and micro scales.

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Analysis of experimental results shows that the films are composed of $K_{0.3}MoO_3$ nanocrystalline grains whose size and orientation vary with production parameters. Measurements like fs-TRs and electrical transport enable detection of phase transition, furthermore indicating that T_p in CDW ground state is some 30 K lower in films than in crystal.

Sažetak

U ovom radu je predstavljen utjecaj parametara proizvodnje (temperatura podloge T_s i parcijalni pritisak kisika p_{O_2}) na granularne tanke filmove $K_{0.3}MoO_3$ (kalijeva plava bronza) proizvedene pulsnom laserskom depozicijom (PLD). Filmovi su ispitani različitim standardnim tehnikama kao što su UV-vis spektroskopija, skenirajuća elektronska mikroskopija (SEM), rendgenska difrakcija (XRD), mikroskopija atomskim silama (AFM), femtosekundna-vremenski razlučiva spektroskopija (fs-TRs) i mjerenje električnog transporta. Općenito, $K_{0.3}MoO_3$ predstavlja prototip kvazi-jednodimenzionalnog (q-1D) materijala koji prelazi u kolektivno stanje vala gustoće naboja (VGN) na temperaturama nižim od temperature prelaza T_p . Njegova svojstva su dobro poznata i ispitana u kristalima, a zbog smanjene dimenzionalnosti, filmovi sa VGN stanjem omogućavaju proučavanje fizikalnih svojstava ovih sistema na mezo i mikro skalama.

Analiza eksperimentalnih rezultata pokazuje da su filmovi sastavljeni od nanokristalnih zrna čija veličina i orijentacija zavise od parametara proizvodnje. Mjerenja električnog transporta i fs-TRs su omogućila detekciju faznog prelaza u VGN osnovno stanje na temperaturi oko 30 K nižoj u filmu nego u kristalu.



Characterization of partially crystalline metallic glass ZrCu

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Keywords:

Partially crystalline metallic glass,
Melt-spinning method,
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Activation energy.

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Abstract: The partially crystalline metallic glasses $Zr_{45}Cu_{55}$ and $Zr_{55}Cu_{45}$ (numbers indicate at. %) in the form of ribbons, with compositions near eutectics, were prepared by melt-spinning method in the Metal Physics Laboratory, Faculty of Science in Sarajevo. The homogeneity and chemical composition of the samples were examined using a scanning electron microscope equipped with a device for energy dispersive analysis. The presence of crystals in the amorphous matrix was confirmed by X-ray diffraction (XRD). According to the XRD results, both sides of the quenched ribbon showed similar structure. The crystallization process was monitored by means of differential scanning calorimetry. Kinetics of the crystallization process was studied through isoconversional methods. It was found that peak crystallization temperature and activation energies are in good agreement with those for the amorphous samples. Overall activation energy of crystallization for $Zr_{45}Cu_{55}$ is evaluated at 3,7 eV, while for $Zr_{55}Cu_{45}$ it is 2,8 eV.

Sažetak

Djelimično kristalinično metalno staklo sastava $Zr_{45}Cu_{55}$ i $Zr_{55}Cu_{45}$ (brojevi označavaju atomske procente) u formi trake, sastava blizu eutektičkih, dobiveno je melt spinning metodom u Laboratoriji za fiziku metala na Prirodno-matemtičkom fakultetu u Sarajevu. Homogenost uzoraka i hemijski sastav ispitani su pomoću skenirajućeg elektronskog mikroskopa opremljenog uređajem za energetske disperzivnu analizu. Prisustvo kristala u amorfnoj matrici je potvrđeno rendgenskom difrakcijom. Prema rezultatima XRD, obje strane trake pokazuju sličnu strukturu. Kristalizacioni proces je praćen diferencijalnom skenirajućom kalorimetrijom. Njegova kinetika je izučavana izokonverzionim metodom. Ustanovljeno je da su temperature kristalizacionog pika i aktivacione energije u dobrom slaganju sa vrijednostima za amorfne uzorke. Ukupna energija aktivacije procesa kristalizacije za $Zr_{45}Cu_{55}$ je 3,7eV a za uzorak $Zr_{55}Cu_{45}$ je 2,8 eV.



The Content of Total Polyphenols in Autochthonous Apple Cultivars from the Territory of Bosnia and Herzegovina

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Keywords:

polyphenols,
apple,
autochthonous cultivars

Abstract: The high number of studies in the field of human nutritionism attribute positive effect of apple to human health to apple's antioxidant characteristics, which are directly correlated with polyphenolic compounds. In this study, the content of total polyphenols was determined in the peel and in the pulp of autochthonous apple cultivars from the territory of Bosnia and Herzegovina. Study included 30 autochthonous cultivars which are grown at the same site in Srebrenik and collected during two seasons, 2012th and 2013th year. The content of total polyphenols was determined spectrophotometrically at 760 nm using Folin-Ciocalteu method. Obtained results indicate that the autochthonous apple cultivars are rich in polyphenols and the higher concentration of polyphenolics compounds were found in fruit peel.

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Sažetak

Najveći broj istraživanja u oblasti humanog nutricionizma pozitivan efekat jabuke na ljudsko zdravlje pripisuje njenim antioksidativnim osobinama koje su u direktnoj korelaciji sa polifenolnim spojevima. U ovom radu sadržaj ukupnih polifenolnih spojeva određivan je u kori i mesu autohtonih kultivara jabuke sa područja Bosne i Hercegovine. Istraživanje je obuhvatilo 30 autohtonih kultivara uzgajanih na lokalitetu Srebrenika koji su ubrani tokom dvije sezone, 2012. i 2013. godine. Sadržaj ukupnih polifenola određivan je spektrofotometrijski na 760 nm metodom Folin - Ciocalteu. Dobiveni rezultati pokazuju da su autohtoni kultivari jabuke bogati polifenolima, pri čemu je pronađena veća koncentracija polifenolnih spojeva u kori ploda.