Grey Literature Repositories and CRIS in a SOA Environment

Nikos Houssos

National Documentation Centre (EKT)
Agenda

- Introduction
- Case studies of systems
  - Hellenic National Archive of Doctoral Dissertations
  - Studies / reports commissioned by government organisations
- Repositories interoperating in a SOA environment
Introduction

- Nikos Houssos
- nhoussos AT ekt.gr
- National Documentation Centre (EKT / NHRF)
- Head, Software Development Unit
- euroCRIS BoardMember
Hellenic National Archive of PhD Theses

- All theses awarded by Greek Universities
- Theses of Greek scholars for PhDs obtained in foreign universities
- In operation at EKT (print archive) since 1985
- 24000 theses in total (since 1901)
- 25% theses not yet digitized
- 1200-1400 arriving every year
- Repository (http://phdtheses.ekt.gr), internal workflow management system and authority servers in a SOA configuration
System architecture

Submitted material

Theses admin system

ETD-MS app profile and full text

Extended service

DSpace Repository

OAI-PMH interface

Open access to theses
User-friendly environment

UNIMARC records

ARGO System

Z39.50 interface

Access / download / transformation of bibliographic records

EKT librarian

REST

Authorities Server

WORKSHOP ON CRIS, CERIF AND INSTITUTIONAL REPOSITORIES - Rome, 10-11 May 2010
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Search for

or browse

Discipline  Date  Author  Country  Language  Degree Grantor

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**Browse by "Degree Grantor"**

**Technical University of Crete (TUC)**

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Study of In2O3 and ZnO thin films for selective gas sensors applications: growth effect on the films structure factor in metal oxide thin films sensing applications

Abstract

The goal of this thesis is the study In2O3 and ZnO thin films for selective gas sensors applications with focus on growth effect on the films structure and surface topology as essential factor in metal oxide thin films. One of the main problems in the field of metal oxide thin film sensors is the impossibility to elaborate a unitary methodology for reproducibility of sensor response in correlation with the surface characteristics. For this, the systematic study of surface characteristics effects on metal oxide thin films sensing involved phenomena plays a major role. Using DC magnetron sputtering and pulsed laser deposition, nanostructured In2O3 and pure or doped ZnO thin films were grown and fully characterized. The study was focused on the morphology of the film and how this affects the photoreduction with UV light and the oxidation by oxidizing gas (ozone) exposure in order to optimize the film properties for gas sensing applications. For this purpose, different series of samples were grown: In2O3 series by DC magnetron sputtering varying the following growth parameters: thickness, growth temperature and total pressure and oxygen:argon ratio during the deposition. Pure ZnO series by DC magnetron sputtering from metallic and ceramic targets varying the following growth parameters: thickness for different constant growth temperatures, temperature for constant thickness, total pressure and oxygen:argon ratio during the deposition. 2% Al doped ZnO by DC magnetron sputtering varying the following growth parameters: thickness and oxygen:argon ratio during growth, In doped ZnO thin films by DC magnetron sputtering varying the following growth parameters: thickness and oxygen:argon ratio during growth. Pure ZnO series by PLD varying the following growth parameters: thickness and substrate temperature with focus on very thin films (40nm and 100nm series at different growth temperatures). All films were fully characterized with respect to their structural and surface topology (for understating and optimization of the influences of the growth conditions on the surface properties), optical/electrical response (for understanding and optimization of the photoreduction and oxidation processes) and sensing behavior. Detailed surface characterization of each film surface was performed and results were collected for further correlation between surface properties and sensing response. Graphical correlations between surface parameters and sensor response ratios were done for each material studied.

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<table>
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<th>Alternative title</th>
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<td>2009</td>
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Suchea Mirela - Petruta (2009, University of Crete (UOC)), Study of In2O3 and ZnO thin films for selective gas sensors applications: growth effect on the films structure factor in metal oxide thin films...

Πανεπιστήμιο Κρήτης  Τμήμα Χημείας
University of Crete  Chemistry Department

Study of In$_2$O$_3$ and ZnO thin films for selective gas sensors applications: Growth effect on the films structure and surface topology as essential factor in metal oxide thin films sensing applications

Ph.D. Thesis
Mirela Petrută Şuchea

Ηρεμέσιο Νοεμβρίου 2009
Thermionic and field emission between bulk and surface electronic states with possible reflections at the surface.

Generation and recombination in the bulk.

Thermionic and field emission between electrode contacts and the bulk.

Furthermore, the model assumed that there is a strong coupling between the rates of these processes. In the case of strong inversion, the analysis is quite analogous to that used in semiconductor device physics. Even if the coupling is well described, the calculation is not simple and the system can probably be simulated numerically.

The analysis of changes in charge carrier mobility near the surface is often considered complicated. The effect of surface roughness on the effective mobility of surface excess carrier due to band bending near the surface has been considered by Greene et al. [12]. A similar analysis, given out almost the same expressions, valid only for depletion and strong accumulation, can be found in reference [13]. Later, more simple approximate expressions have been derived by Goldstein et al. [14]. For scattering by fixed surface states under strong coupling it may be also possible to adopt an approach developed for MOSFETs [15].

If no Fermi level pinning is present at the surface, the screening length is given by the bulk intrinsic Debye length [13], given by:

$$L_s = \frac{\pi k_B T}{q^2 n_p n_h}$$

where $\pi$ and $\kappa$ are the specific and vacuum permittivity, $k_B$ is Boltzmann constant, $T$ is the temperature, $q$ is the electron charge and $n_p$ and $n_h$ are the densities of free electrons and holes, respectively. In case of Fermi level pinning by “metal-like” surface states, the scattering potential in the bulk will be a quadrupole potential decreasing as $1/r^3$. The screening in the surface plane is given by the 2D screening length [16], given by:

$$\beta = \frac{1}{\kappa n_p m^*}$$

where $\kappa = 4\pi \varepsilon_0 m^* q^2$ is the Bohr radius, $m^*$ being the effective mass and $d$ is the thickness of the 2D system. The surface screening length is of the order of a few nanometers.

All this information is very useful and applies quite well locally in a very narrow region or for epitaxial growth, but it becomes practically impossible to be used for the explanation/understanding of the behavior of real semiconductor films.

Conduction mechanisms

The oldest models, regarding conduction mechanism in polycrystalline films, are based on the grain boundary conduction model - developed by Petritz [17] in 1956, which is based on the assumption that the conductivity behavior in polycrystalline films closely approaches that of semiconductors with predominant grain boundary conduction mechanism. The carrier mobility in these films is limited by scattering at the grain boundaries and as well by normal bulk processes. A model of intergranular boundaries affected by the diffusion of an active gas was studied by Seager and Ginley [18] to explain the changes of conductivity seen in polycrystalline silicon. As found out, diffusion of oxygen down the grain boundaries promoted in these regions significant changes in the density of defect states, resulting in a decrease of conductivity. This model, described extensively by Seager and Castner for the case of polycrystalline silicon [19], has been adopted until now as the basic approach to explain the conductivity mechanism in polycrystalline metal oxide films. The validity of this model has been confirmed in polycrystalline metal oxide films by experimental results related to the dependence of the conductivity on the temperature, but it cannot explain experimental results when the films are used as sensing layers or when photocatalysis is involved. The main features of this conduction model are: conduction from grain to grain, disturbed by surface barriers which are strongly influenced by chemisorbed oxygen.

The formation of potential barriers at the grain boundaries was proposed by Petritz [17] in 1956, in addition to the normal lattice discontinuity caused by the boundaries. Other models have also been proposed to explain the transport behavior due to the grain boundaries, as that of Volger [20] and Berger [21]. Since then, grain boundaries have been reviewed in detail by Kazmerski [22], while more trial have also appeared using different approaches like the ones of Gardner [23, 24], Bänsch and Weimär [25, 26].

Petritz theory constitutes the basic theorectical analysis of transport mechanisms in polycrystalline semiconducting films. According to this model, grain boundary potential barriers are formed in an n-type semiconductor when the grain boundary region has a lower chemical potential (Fermi level, $E_F$) for majority carriers, than the grains, due to the density of defect states in this region. These defect states cannot appear due to the tendency of grain boundaries to act as diffusion whirlpool for impurities. Therefore, these defect states can be treated as trapping centers for majority carriers, resulting in a reduction of their concentration in the boundary region. This in turn causes a flux of majority carriers into the boundary region, creating a space charge build up at these boundaries, which prevents further flux of majority carriers and therefore forms a depletion region for them. This can be presented in a band diagram by an upward bending of the conduction and valence band edges. For a p-type semiconductor, respectively, the band edges bend toward the Fermi level.

The accumulated negative charge near a joint force the energy bands to be bend upwards by an amount of $\phi_B$. Since the Fermi energy at equilibrium must be continuous over the grain boundary, the height of the potential barrier, $\phi_B$, will be given by the difference of the Fermis’s grain-boundary energies. Majority carriers can cross over a grain boundary potential barrier following two different mechanisms. One is the thermal emission over the barrier and the other is the quantum mechanical tunneling. For the evaluation of electrical characteristics of semiconducting films, most models compare the behavior of the films to that of the bulk crystal. If the bulk crystal was perfect, the condition carriers could flow unimpeded in a perfect periodic potential. In a real bulk crystal lattice, vibrations, impurities and defects can cause deviations from the ideal behavior, an approach which can be used in polycrystalline thin film analysis, which, however, can result in quite inexact results. The carrier mobility is related directly to the mean free time between collisions, in which is determined by the various scattering mechanisms. For bulk crystal behavior in semiconductors, two scattering processes are important: lattice scattering and impurity scattering. In polycrystalline semiconducting films, however, the effect of the grain boundaries should also be considered as an additional scattering mechanism for the carriers. The carriers collide at the grain boundaries and, in a steady state, have an effective mean free path $\lambda_g$ constrained by the size of the grains, and a mean...
Conduction mechanisms

The oldest models, regarding conduction mechanism in polycrystalline films, are based on the grain boundary conduction model - developed by Petritz [17] in 1956, which is based on the assumption that the conductivity behavior in polycrystalline films closely approaches that of semiconductors with predominant grain boundary conduction mechanism. The carrier mobility in these films is limited by scattering at the surface and the grain boundaries as well as by normal bulk processes. A model of intergrain boundaries affected by the diffusion of an active gas has been used by Seager and Ginley [18] to explain the changes of conductivity seen in polycrystalline silicon. As found out, diffusion of oxygen down the grain boundaries promoted in these regions significant changes in the density of defect states, resulting in a decrease of conductivity. This model, described extensively by Seager and Castner for the case of polycrystalline silicon [19], has been adopted until now as the basic approach to explain the conductivity mechanism in polycrystalline metal oxide films. The validity of this model has been confirmed in polycrystalline metal oxide films by experimental results related to the dependence of the conductivity on the temperature, but it cannot explain experimental results when the films are used as sensing layers or when photoconductive is involved. The main features of this conduction model are: conduction from grain to grain, disturbed by surface barriers which are strongly influenced by chemisorbed oxygen. The formation of potential barriers at the grain boundaries was proposed by Petritz...
Studies / reports commissioned by government organisations

- Work funded by governmental organisations and done by companies, universities, research centres, individuals

- Important material for diverse audiences
  - Significant facts and findings
  - Spatial and temporal focus

- Wide range of disciplines – particularly important for social sciences
Requirements

- For the general public:
  - Dissemination of the material to interested users

- For government organisations:
  - Avoid allocation of funding for work already done in the past
  - Transparency regarding where public funding goes - reporting on contracts awards for studies to specific individuals and organisations
Complex links / roles
Reporting
Evaluation

Example links / roles

CRIS

Organisation - Project:
Funder / Supervisor / Contractor

Person - Project:
Coordinator
Team leader
Team member
Evaluation

Persistent ids to docs
Content presentation
Rights
Access statistics
Repositories – more emphasis on digital content?

- Presentation of content adapted according to
  - type (book, article, data set, …)
  - form of digital material (text, image, …)
  - devices: e-book readers, tablets, smartphones, …

- Improvement of user experience regarding content presentation – in addition to downloading files
- Full-text search and hit highlighting.
- Automatically checking the quality of digital content upon submission and helping the submitter improve it.
Achaïe II 022: Τιμητική για τον Γερμανικό, για τον Τήνο και πάτωμα της πόλεως

Achaïe II 023: Τιμητική για τον αυτοκράτορα Τραίανό (†)

Achaïe II 024: Τιμητική για τον αυτοκράτορα Αδριανό

Achaïe II 025: Τιμητική για τους αυτοκράτορες και κατάρας της πρώτης τετραρχίας

Achaïe II 026: Πλιοδέικτης των αυτοκρατόρων Βαλεντίνιανου και Ουαλέγγος

Achaïe II 027a, b: Πλιοδέικτης των αυτοκρατόρων (α) Τραίανο, (β) Αρκαδίου και Ουαλέγγος

Achaïe II 028: Πλιοδέικτης των αυτοκρατόρων Μάρκου Αυρηλίου και Λουκίου Ομήρου

Achaïe II 029: Πλιοδέικτης των αυτοκρατόρων Βαλεντίνιανου και Γαλλίνου
Title: Achaei II 002: Αναθηματική στην Αφροδίτη

Date:

5ος π.X αι.

Identifiers:

Μουσείο του Λούβρου, τμήμα Καλλικών, αρ. ευρ. Br 167.

Apparatus:

α. Β. Φράνκελ, που περιγράφει στα ενδόματα Κόρμης, Κόρμης ΣΟΡΥΒΑ De Ridder, ο οποίος διερευνά το τρίγωνο Α ενώ Σ ή μην το πάρει Σορυβά στον Άρη. Την άρωμα επιγραφής και την Ω, οι Οον Ωκομης, συμπληρώσεις του Λούβρου (επιστολή 17.10.1996). Ο χαρακτηριστικός χρώμα της επιγραφής θα χαρακτήρισε την ορθότητα καθώς του v.

Spatial:

Πάτρα, δήμος περιοχής Κοινότητας της Πάτρας.

Subjects:


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- Πράγας, Tolles-Kastenbein, Peplosfigurinen 154-55, σφ. 24a και τμ. 102b-c Osanna, Santuario e culti 11, σφ. 244.

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Devices
Potential environments for repositories

- Research: CRIS, IR, VRE
- E-Learning - VLE / LMS and Learning Object Repositories
- Workflows for the production of content => EKT HEDI system
- E-Publishing
  - Peer review management systems
  - Reproduction rights management systems
- Content re-purposing
Potential environments for repositories

Repositories

VLE / LMS
CRIS
E-Publishing
Content Workflow
Requirements beyond existing standards

- Full CRUD APIs (Not only deposit / SWORD)
- Retrieval – update of digital material (full text)
Thank you