Auger and Photoemission Study of U-N-O thin films

Subject: Study of thin films of mixed uranium oxides/nitrides by Photoemission and AES.
Films have been prepared by reactive sputter deposition in an Ar plasma in presence of N2 and O2 admixtures.

Aim: elucidate if a solid solution of UO and UN (known as uranium oxynitride UNxO1-x) can form by this synthesis method. Such ternary oxide has been described for bulk compounds. Since sputter deposition can produce very finely dispersed systems, this looked like a good method for producing the oxynitride. Oxynitride has uranium in a low oxidation state (UN: formally 3; UO: formally 2). Initially UN films with an increasing oxygen content were deposited. ). The oxynitride is metallic and it can be assumed that the U5f are still itinerant and pinned the EF: for UN they are and for UO they also should be.
We studied whether the oxygen incorporation goes along with a DOS at EF (pointing to UO formation) or whether it simply leads to the formation of the UO2 semiconductor (no DOS at EF)-

Experiment: The series started with deposition of UN and then increasing gradually the O2 pressure. U4f, O1s and VB spectra (by HeII). Also Auger spectra of U, O and N were taken. Depositions were done at room temperature and elevated temperature. We searched for the onset of UO2 formation (characteristic U4f peak), because at sufficiently high O2 pressure this oxide will form – oxygen simply displaces nitrogen.

File Format: Files are stored in the VAMAS format. This is a universal formed used by commercial data analysis programs such as *CasaXPS*. Description of the VAMAS format can by found in the internet. See e.g.

https://github.com/Yohko/importtool/blob/master/Igor%20Procedures/import%20tool/import\_VAMAS.ipf

File types: see lab book
All files have the extension .VMS (VAMAS Format(

Auger: NKLL, U4p3/2, OKLL
Auger\_N: NKLL
Auger\_O: OKLL
Auger\_U: U4p3/2 (designation Auger is actually incorrect)
U\_N1s
UN\_HeI
UN\_HeII
UN\_O1s
UN\_U4f
UN\_U4f\_N1s
U\_O1s
U\_U4f

Lab book: Description of all experimental conditions (labbook.docx)

Meta Data

* Collection Acronym (The acronym must be represented by a single and unique alphanumeric string, which may also include the "-" character)
**UNO-FilmsXPS**

o   Collection Title
**Auger and Photoemission Study of U-N-O thin films**

o   Collection Description
**See previous page**

o   Collection contact name/email

o   Unit

o   Science area (according to the 10 science areas of pubsy)

o   Visibility (public or restricted. The default is to set it in public, but in case your data can only be shared with the Commission, then you need to set it in restricted)
**Public**