Contribution ID: **18** Type: **not specified**

Effects of radiation, ion and electron beams emitted from the dense plasma focus on Tin and its alloys

Thursday, 8 October 2020 14:50 (30 minutes)

Mather – type low energy (2.8 kJ, 15 kV, 25μF, 54 kA) plasma focus (PF) device is used for deposition of the tin alloy (60%Sn+40%Pb) on the intrinsic silicon (111) substrates under different conditions: distance from the top of the anode (3, 4, 5, 6, 7 cm) and number of shots or discharges (5, 10, 15). The plasma focus discharges are operated in nitrogen and argon gases at a pressure of around 0.8 mbar. The analysis of silicon treated targets demonstrates that the amounts of both elements decrease with increasing distance up to 7 cm from the anode. SEM images show that the size of deposited particulates from the anode materials have different dimensions and distribution according to the used number of plasma shots. Variation of atomic concentration (%) of Sn, Pb and N as a function of etching time are found using XPS technique. Five channel (BPX65 PIN) diode x-ray spectrometer (DXS) is also assembled, installed and tested on PF device to investigate x-ray emission properties of the hot dense plasma. The obtained signals of DXS reveal that there is no x-ray emission from AECS-PF1 device at the present operational parameters.
The computational program Lee model (RADPFV5.15FIB&REB) is applied on the PF device working in nitrogen and argon in order to simulate the realized experiments. The used PF parameters and the properties of electron as well as ion beams (flux, heat flux, current, fluence, energy fluence, number of electrons, energy in beam, damage factor, etc..) are determined for each shot. The corona model has been also used as an approximation for computing the thermodynamic data of the tin plasma generated in the plasma focus. The ion fraction, effective ionic charge number and effective specific heat ratio for tin plasma have been calculated at different temperatures. Based on the obtained plasma temperature range (100 – 130 eV) in PF device, the Sn+18, Sn+19, Sn+20, Sn+21 ionization fractions are expected to be generated during the pinch plasma.

Primary author: AKEL, Mohamad (Atomic Energy Commission of Syria (AECS))

Co-authors: AHMAD, M.; AL-HAWAT, Sh.

Presenters: AKEL, Mohamad (Atomic Energy Commission of Syria (AECS)); AHMAD, M.; AL-HAWAT, Sh.

Session Classification: Experiments and simulations