LOG NUMBER OF PAPER: 1

TITLE OF PAPER: Metallographic and XPS analyses of deposits from steam generator

AUTHOR(S): Petrů J., Sajdl P., Dzurus M.

POSTAL ADDRESS OF EACH AUTHOR: Department of Power Engineering, ICT Prague, Technická 5,

16628, Prague 6, Czech Republic

CORRESPONDING AUTHOR'S E-MAIL ADDRESS, TELEPHONE AND FAX NUMBERS:

petruj@vscht.cz, +420220443078

Metallographic and XPS analyses of deposits from steam generator

Petrů J., Sajdl P., Dzurus M.

Department of Power Engineering, ICT Prague, Technická 5, 16628, Prague 6, Czech Republic

Abstract :

The presented work examines the samples of deposits from steam generators. These samples were collected at the nuclear power plant. The deposits were studied by metallographic methods and methods of image analysis by programme NIS-Elements AR 3.0. The layers were characterized by three distinctive areas: homogeneous part (in contact with the wall tubes), porous central part and broken part (growth into the area. XPS method was used to determine the composition of deposits.

Keywords:

steam generator, deposits, the layers structure, XPS

Experimental :

The method of image analysis (NIS-Elements AR 3.0) was used to determine the layers structure and the XPS method was applied to analyse surface chemical composition.

The ESCA Probe P (Fig.1) made by Omicron Nanotechnology is equipped with monochromator, two types of ion guns, electron detection system with 5 chaneltrons, with source of low energy electrons for charge compensation, source of ultraviolet ray for UPS (ultraviolet photoelectron spectroscopy) for analyses of valence electrons, with detector of secondary electrons and with source of electrons for Auger spectroscopy. Analysis is carried out under UHV condition (UHV Ultra High Vaccum - aprox. 10E-10 mbar). The analysed area depends on the setting of instrument and extends from diameter approx. 70 μm to diameter 1.3 mm.

Conclusions :

The layers were characterized by three distinctive areas: homogeneous part (in contact with the wall tubes), porous central part and broken part (growth into the area. XPS method was used to determine the composition of deposits (Fig.2,3).

The XPS results showed a presence of Fe_3O_4 , the components of the material – Fe, Cr, Ni; and small impurity content – Cu, Zn, Pb; and impurity from the water – Na,Ca, N, S, Cl (Fig.5). Examples of measured XPS spectra are given in Fig.4.

Acknowledgements :

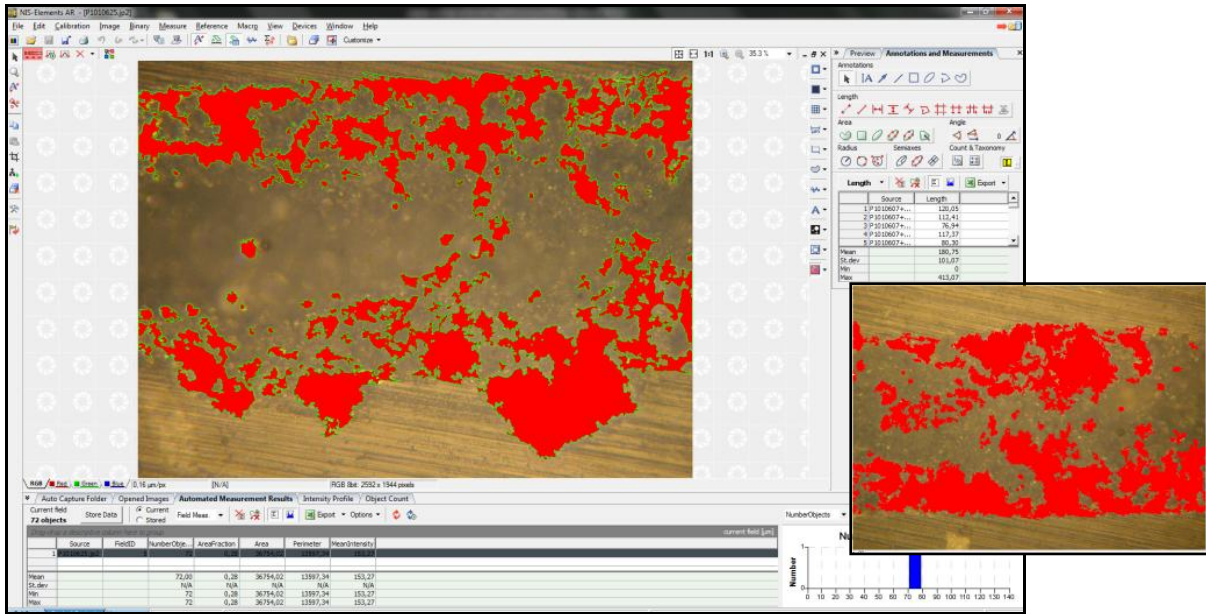## References :

http://srdata.nist.gov/xps/

Fig. 1: ESCA

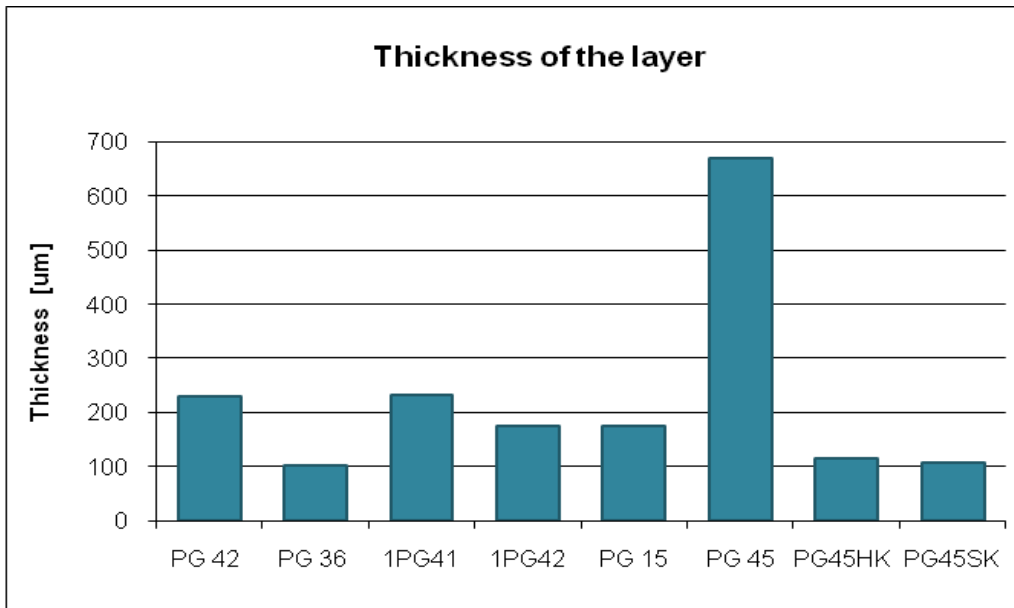Fig. 2: The image analysis (NIS-Elements AR 3.0)
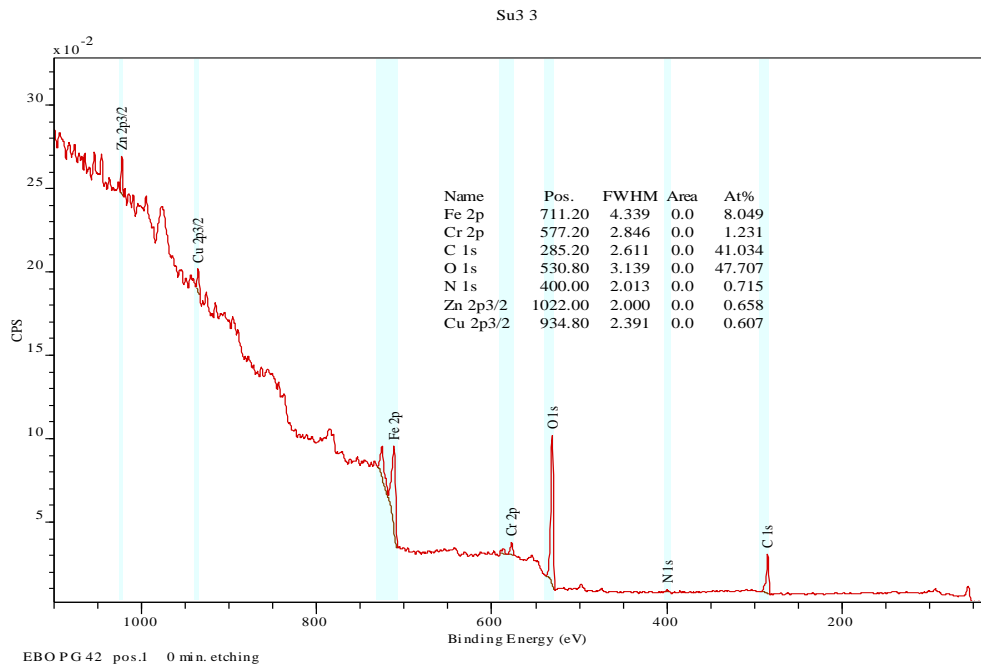

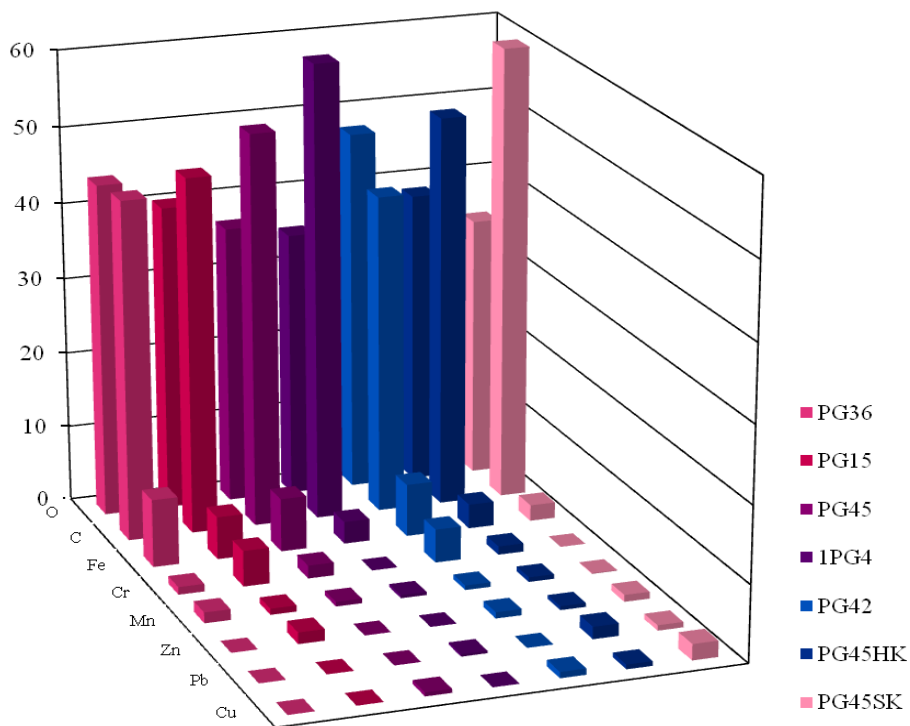
Fig. 3: Thickness of the layers

Fig. 4: XPS spectrum - example

Fig. 5: Content of components in the samples (At%)