

PRELIMINARY EXPERIMENT ON DISCHARGE CLEANING OF A SECTOR  
MAGNET VACUUM CHAMBER FOR THE RIKEN SSC (1)

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Abstract

The miscellaneous surface cleaning on the pieces of stainless steel were examined for cleaning of large vacuum vessel. The degree of cleanliness is evaluated by Electron Spectroscopy for Chemical Analysis (ESCA).

1. Introduction

Surfaces of vacuum chamber must be kept clean to decrease the desorption rate. In this report, methods of cleaning the surface are examined. The degree of surface cleanliness is evaluated by the surface analysis of ESCA. Ordinary, supersonic cleaning in solvent is used for ultra high vacuum components. But this method is not practical for the large vessels because it requires a large equipment of cleaning and because it generates toxic vapour of organic solvents. To solve these problems, the method of washing a large vessel with cleanser and water is examined.

2. Method of the test

Samples of stainless-steel AIS304 were used. They were cut in the following size to mount in the ESCA; width of 10.5 mm, length of 12.5 mm and thickness of 0.5 mm. The surfaces of all samples were blasted with glass beads of 150 mesh and made clean by miscellaneous methods given in Fig. 2. After such treatments, the surface elements of the samples were analysed at a pressure of  $10^{-7}$  Pa in the ESCA.

3. Experimental results

The wide range electron spectrum was measured by the ESCA. Three typical cases are shown in Fig. 1. It is seen that the height of the carbon peak is decreased drastically in cases (b) and (c) compared with in case (a). The results obtained with the various cleaning methods are arranged in the order of their magnitude of carbon peak and are shown in Fig. 2.

4. Discussion

In the experiment, the organic substance on the surface of stainless-steel is undesirable materials and is to be eliminated by cleaning. The electron spectra of carbon is separated into two peaks by the effect of chemical sifting. One peak corresponds to state of metal carbide and the other does hydrocarbons. Therefore the latter is surface contamination that needs to be eliminated. The peak height of hydrocarbon decreases to the same level of its metal carbide, in the two cases of supersonic cleaning and washing with cleanser. Iron spectrum appeared on the metal surface after eliminating the organic substance. The degree of cleanliness can be known by the height of carbon peak. The peak of organic substance is seen in the spectrum. Presumably we think it is due to the contamination which adsorbed during an exposure to the atmosphere.

5. Conclusion

The surface cleaning is examined by surface analysis of ESCA. The clean surface where organic substance is eliminated is obtained by washing with cleanser and distilled water. The method is harmless for human body and it is not necessary special equipment and room for washing.

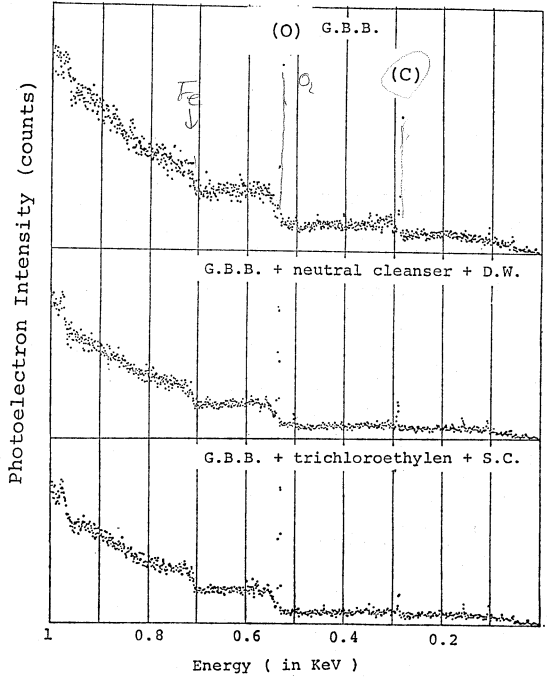
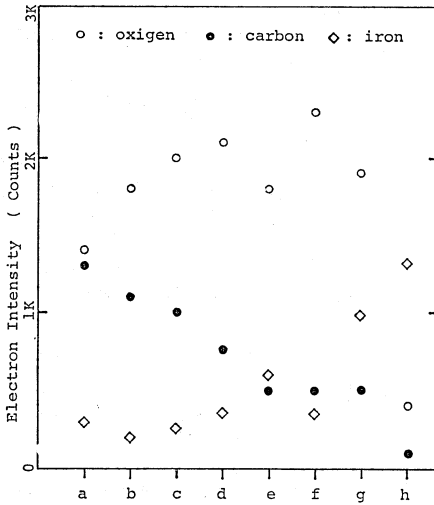


Fig.1 Photoelectron spectrnm by ESCA

- a) Glass beads blust
- b) Washing with neutral cleanser and distilled water
- c) Supersonic cleaning in the trichloroethylene



- a) Glass Beads Blust ( G.B.B. )
- b) G.B.B. + Distilled Water (D.W.)
- c) G.B.B. + Trichloroethylene
- d) G.B.B. + Neutral Cleanser (N.C.) + D.W.
- e) G.B.B. + N.C. + City Water
- f) G.B.B. + Trichloroethylene + Supersonic Cleaning (S.C.)
- g) G.B.B. + Trichloroethylene + Baking (200°C, 2 hr)
- h) G.B.B + Trichloroethylene + Baking + Ionetching (40 min)

Fig.2 The result obtained with the various cleaning methods are arranged in the order of their magnitude of cabon peak.