SIMPLE APPARATUS FOR PLASMA PROCESSING AT 13.56 MHz[1])

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Some details are given of a simple apparatus applicable to dry plasma processing in electronic component production and in the faillure analysis of the electronic components and assemblies.

ПРОСТАЯ АППАТУРА ДЛЯ ПЛАЗМЕННОЙ ОБРАБОТКИ ПРИ ЧАСТОТЕ 13,56 МГц

В работе подробно описана простая аппаратура, которую можно применять для сухой плазменной обработки в технологии электронных элементов, а также для анализа неисправностей электронных устройств и узлов.

I. INTRODUCTION

Plasma processing is gaining importance in many fields of the applied research and in industry. Let us mention only a few applications: sample preparation in optical and electron microscopy and in electron probe analysis; cleaning and etching operations in the microcircuit production; decapsulation of integrated circuit modules; etc.

The physical aspects of those processes have been discussed at low-temperature-plasma conferences [1], [2]. The elementary mechanisms are well understood. However, the parameters of real plasma processing should be acertained experimentally.

Equipments for such techniques are usually expensive and too large. The present contribution gives a short description of a simple, desk-top apparatus made of the easy-to-get parts.

II. APPARATUS

Figure 1 shows a simplified diagram of the equipment. The desk-top part is an aluminium-sheet box, with dimensions of $400 \times 300 \times 300$ mm. The box is drawn

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in Fig. 1 (dashed line). The main part of the apparatus is a SIMAX-glass chamber (an inner diameter of 50 mm and a length of 150 mm), supplied by the Slovenské závody technického skla — Bratislava. The vacuum system consists of a rotary pump (1.2 m^2/h), an electromagnetically operated valve, an air-admission valve, a reaction chamber with a silicone gasket, a thermoelectric vacuum gauge, a stainless-steel capillary, a needle valve and the gas supply (oxygen compressed to 15 MPa). The working pressure is 60 to 120 Pa. If the air-admission valve is opened, the chamber can be easily removed from the apparatus, due to a "self-sealing" arrangement.

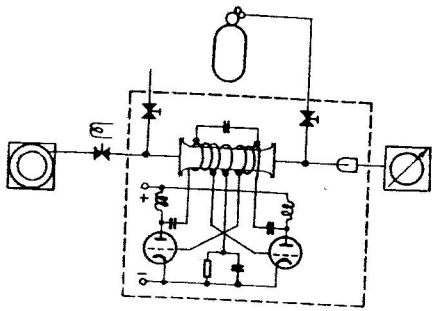

Fig. 1. Set-up of the apparatus for plasma processing at 13.56 MHz and 50 Pa.

The electronic part is a simple oscillating circuit [3], which consists of two pieces of electron tubes RFT SRS 4451 (or TESLA REE 30 B), a 7-turn coil of 5-mm-copper wire, a 5-kohm grid resistor, a supply transformer (220 V – 500 V – 6.3 V), a do-it-yourself capacitor (teflon, copper foil; 100 pF), and of some other components. This circuit is adjusted to oscillate at 13.56 MHz to satisfy the related standards.

III. CONCLUSIONS

A brief description of a desk-top apparatus for plasma experiments has been given. This device finds many applications not only in the faillure analysis laboratory, there are many further possibilities for its use apart from it.

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