

Microincubator for Voltammetry*

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Voltammetry is an electrochemical analytical technique. Essentially, it detects oxidation currents of certain electroactive substances (Adams 1969; Justice 1987). The principle of the method has been derived from polarography (Heyrovský 1924). The method enables qualitative and/or quantitative analysis of also electroactive biological agents such as neurotransmitters (Gonon et al. 1980, 1981), psychotropic drugs (Alonso et al. 1988) etc., even under in vivo conditions. Voltammetric working electrode can be adapted to measure DNA concentrations in vivo (Paleček 1988). In vitro voltammetric analysis of substances showing temperature-dependent activity (as a rule, 37 °C for biological materials) requires maintaining constant temperature during the measurements.

So far, commercially available thermostatic devices have been used for this purpose. However, they usually require large volumes of distilled water, sometimes exceeding 10 l. Keeping similar amounts of liquid at the required temperature is rather energy consuming (requiring the supply of 2—3 kW). Temperature control in common thermostats is of the spot type, based on bimetals or control mercury thermometers. The disadvantage of similar systems of temperature control include the generation of disturbing voltage steps which cannot be sufficiently suppressed.

The disturbing voltage induces noise in the measured signal, thus interfering with the measurements. Another disadvantage of the commercially available thermostatic devices is the excessive volume of liquid needed to maintain constant temperature of small volumes of voltammetrically analyzed samples.

A microthermostatic apparatus will be presented, enabling linear control of present temperature of small volumes (0.3—1 ml according to the chamber size) of analyzed substances during voltammetric measurements. The design of the

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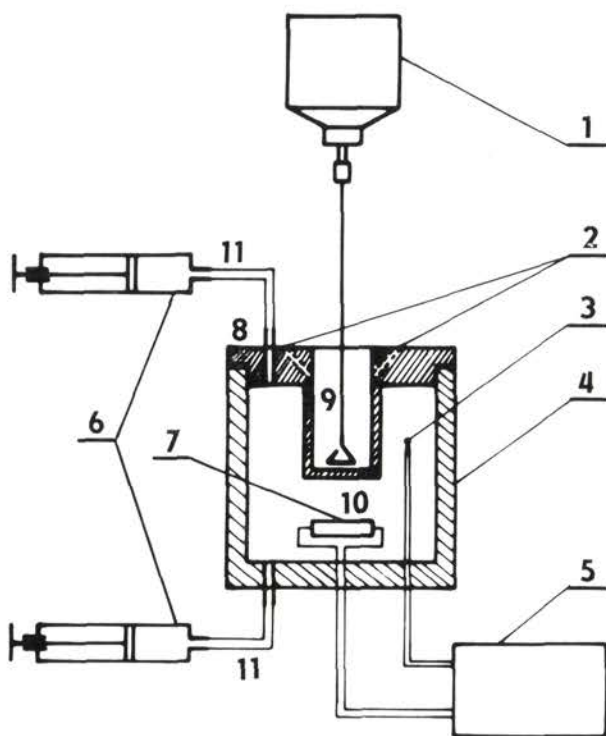


Fig. 1. Schematic drawing of microincubator for voltammetric measurements. See text for detailed description.

apparatus is based on commercially available microprocessors.

The microincubator for voltammetric measurements consists of incubator body (4) and lid segment (8) containing microincubator chamber (9) and openings (2) for voltammetric electrodes. The heated space (10) of the microincubator is filled up with distilled water. Heater element (7) is of the resistance type, and the preset temperature is controlled by thermistor (3). Volume distensibility of distilled water in heated chamber (10) is compensated for by two syringes (6) connected with heated chamber (10) through cannulae (11). The preset temperature is linearly stabilized by electronic circuits of thermostat (5) (TESLA 1975). The apparatus is equipped with stirrer (1) for stirring the analyzed liquids.

The microincubator as described above can be employed for *in vitro* voltammetric analysis of small volumes of electroactive substances which show temperature dependences of concentration or interactions (e.g. reaction kinetics

of antigen-antibody or receptor-ligand interactions). Also, the device can be employed in any experimental layout requiring constant temperature for small volumes of reaction components.

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