

THE HELMHOLTZ-ACOUSTIC RESONATOR SYSTEM FOR VOLUMES  
DETERMINATION OF OBJECTS WITH UNRESTRICTED FORM

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Methods and instrument for measurements to determine volume and porosity of arbitrary solids are offered.

The frequency of an acoustic resonator depends on parameters on its geometry, in particular, on the free volume of resonator's capacity. Due to this it is possible to determine the volume of a body placed into the resonator. Besides the resonance line (its half-width) depends on dissipation of the energy of oscillations in the system. Additional convergence of oscillations is due to presence of pores and cavities in the substance contained by resonator and can be used to determine parameters of porosity.

A closed resonator of original design used in the instrument essentially reduces the effects of external noise. The methods are based on automated recording of the resonance curve parameters of which are used to obtain the values being measured. The drive of frequency is controlled by a personal computer which is also used for datamation of the resonance amplitude values. Particularly, the volume of a body is determined from the resonance frequency while parameters of porosity - from the shape of the resonance curve.

Theoretical considerations show that sensitivity with respect to volume measurements is proportional to the ratio of volumes of the body and the resonator. Consequently, the required interval and accuracy of measurements are selected by linear dimensions of the resonator capacity. The instrument presently is supplied with a resonator of 18 mm in diameter and maximum lift (height of the cell) equal to 30 mm, the frequency being in the kHz range. The accuracy of volume measurements can reach  $0.1 \text{ mm}^3$ . Measurements of the porosity parameters allow to make evaluations of mean linear size of pores with an accuracy to  $1 \mu\text{m}$ .

The instrument and methods have no analogues