The effect of Nickel on the Surface Energy of Solid Silver

Antonova Valeriya

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The aim of the work: to measure the surface energy by the method of zero creep of samples of solid silver coated with nickel. In this case the nickel content should be within the two–phase region analysis of literature on the topic, preparation of sample, experiment, study of morphology surfaces, analysis of the results.

Introduction:

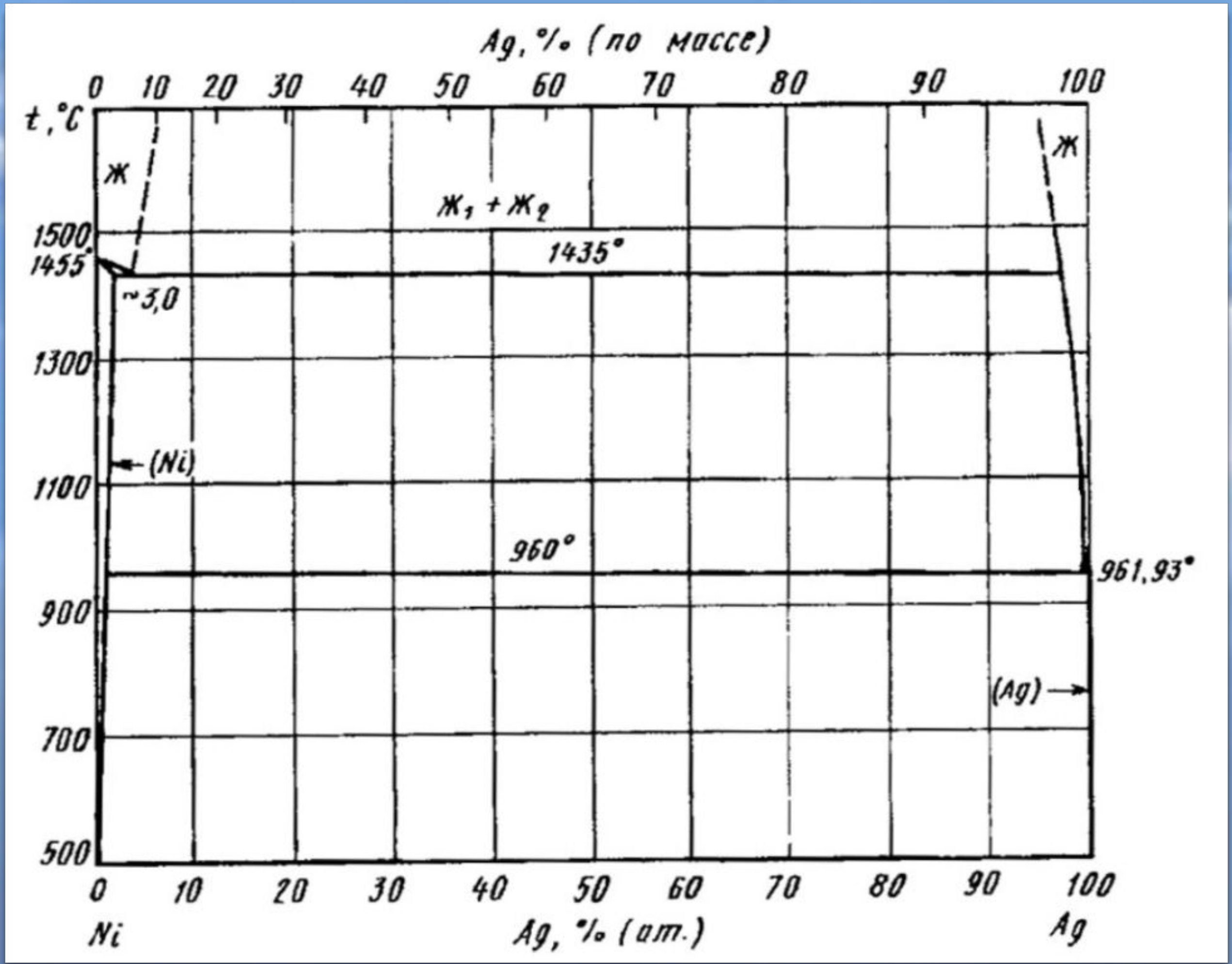


Fig. 1. Phase diagram Ag-Ni.

Experimental setup:

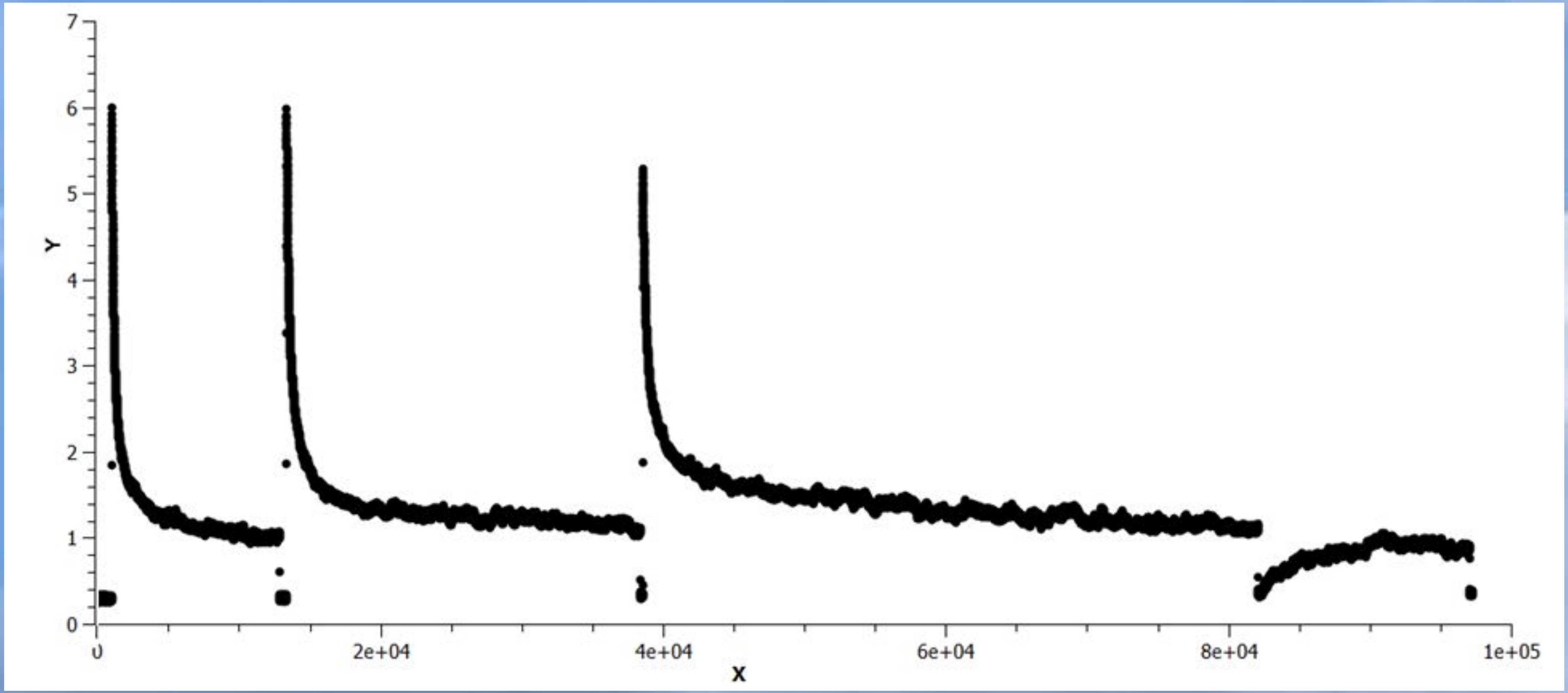
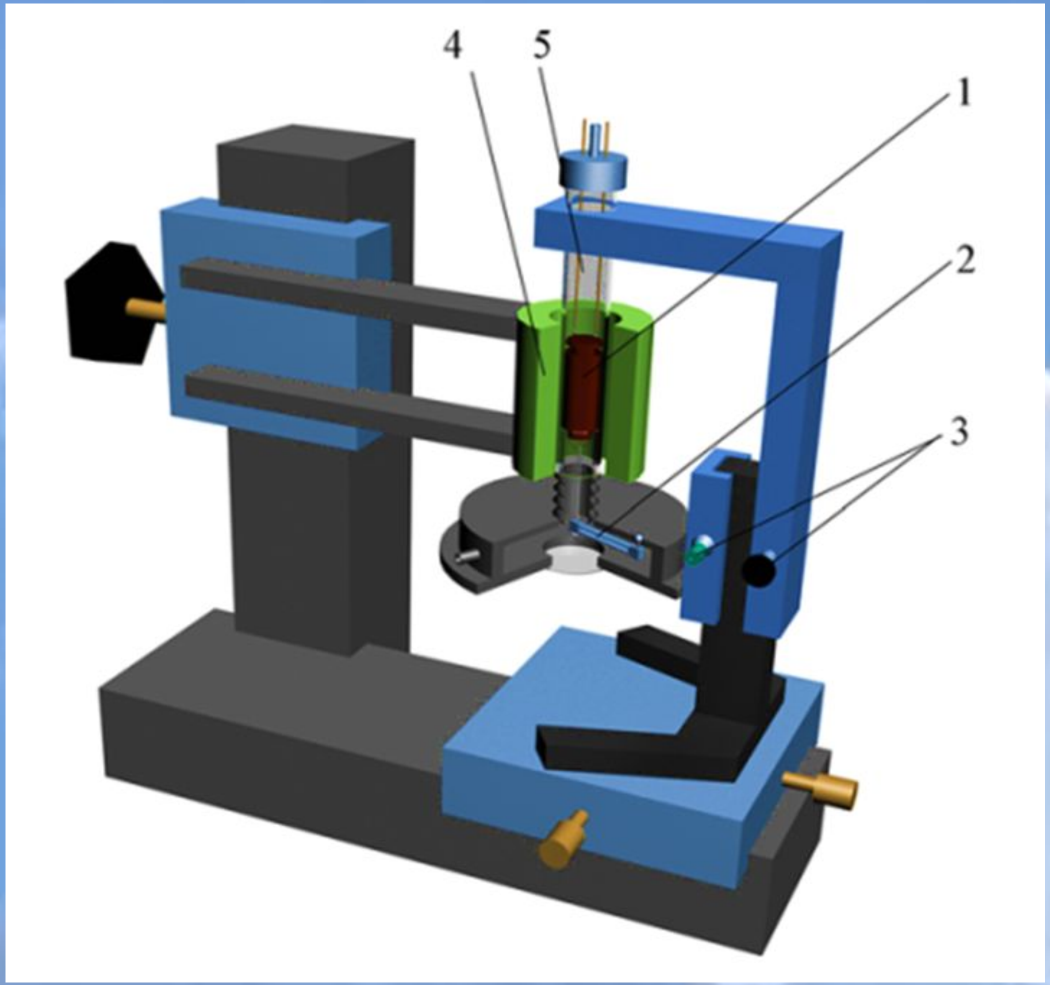


Fig. 2. Experiment Graphs.



1 – sample;
2 –weight sensor;
3 –micro- and macro- offset screws;
4 –furnace;
5 –camera.

Fig. 3. Equipment for measuring the dependence of the load on time and temperature.

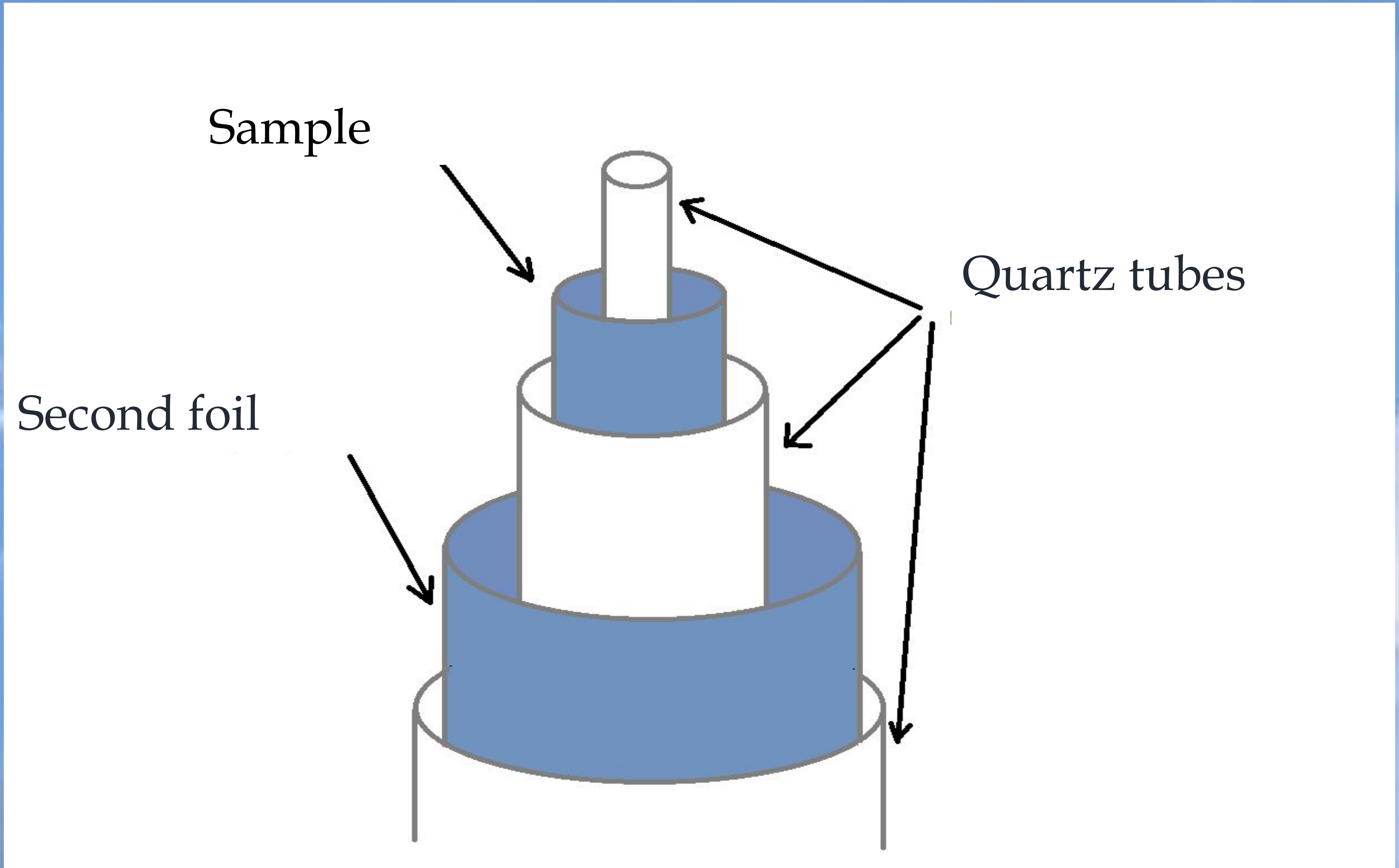


Fig. 4. The figure shows a schematic representation of the sample.

Method description:

- Deformation in this method follows the Nabarro-Herring mechanism

$$\frac{d\varepsilon}{dt} = \frac{1}{\eta}\sigma',$$

where ε – relative deformation, η – viscosity index, σ' - tension.

$$\eta = B\frac{kT}{D\Omega}V^{2/3},$$

where B –constant from Nabarro-Herring theory, Ω –atomic volume, D – bulk diffusion coefficient, V – average grain volume.

$$\sigma' = \sigma - \sigma_0,$$

σ_0 – zero creep stress; σ – stress set by the sensor.

Since the sensor is also an elastic beam, then

$$\varepsilon = A\sigma,$$

proportional factor that corresponds to the installation.

$$\begin{cases} \dfrac{d\varepsilon}{dt} = \dfrac{1}{\eta}(\sigma - \sigma_0) \\ \varepsilon = A\sigma \end{cases} \quad => \quad \frac{Ad\sigma}{dt} = \frac{1}{\eta}(\sigma - \sigma_0) \quad =>$$

$$\sigma = \sigma_0 + (\sigma_{\text{нач}} - \sigma_0)\exp\left(-\frac{t}{\eta A}\right)$$

The resulting equation is the dependence of the sensor voltage on time at a specific temperature.

$$\gamma_c = \frac{\sigma_0}{\dots}$$

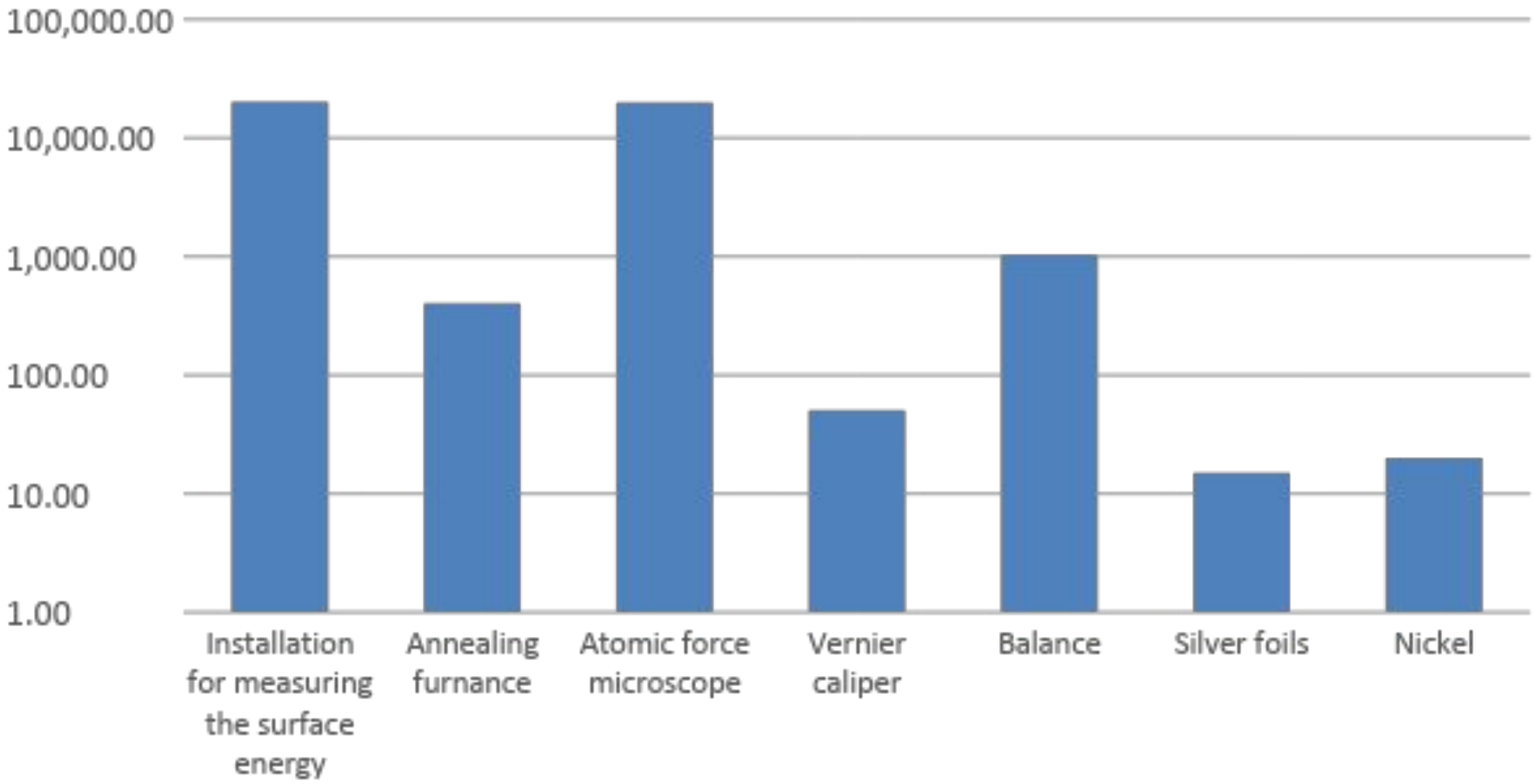
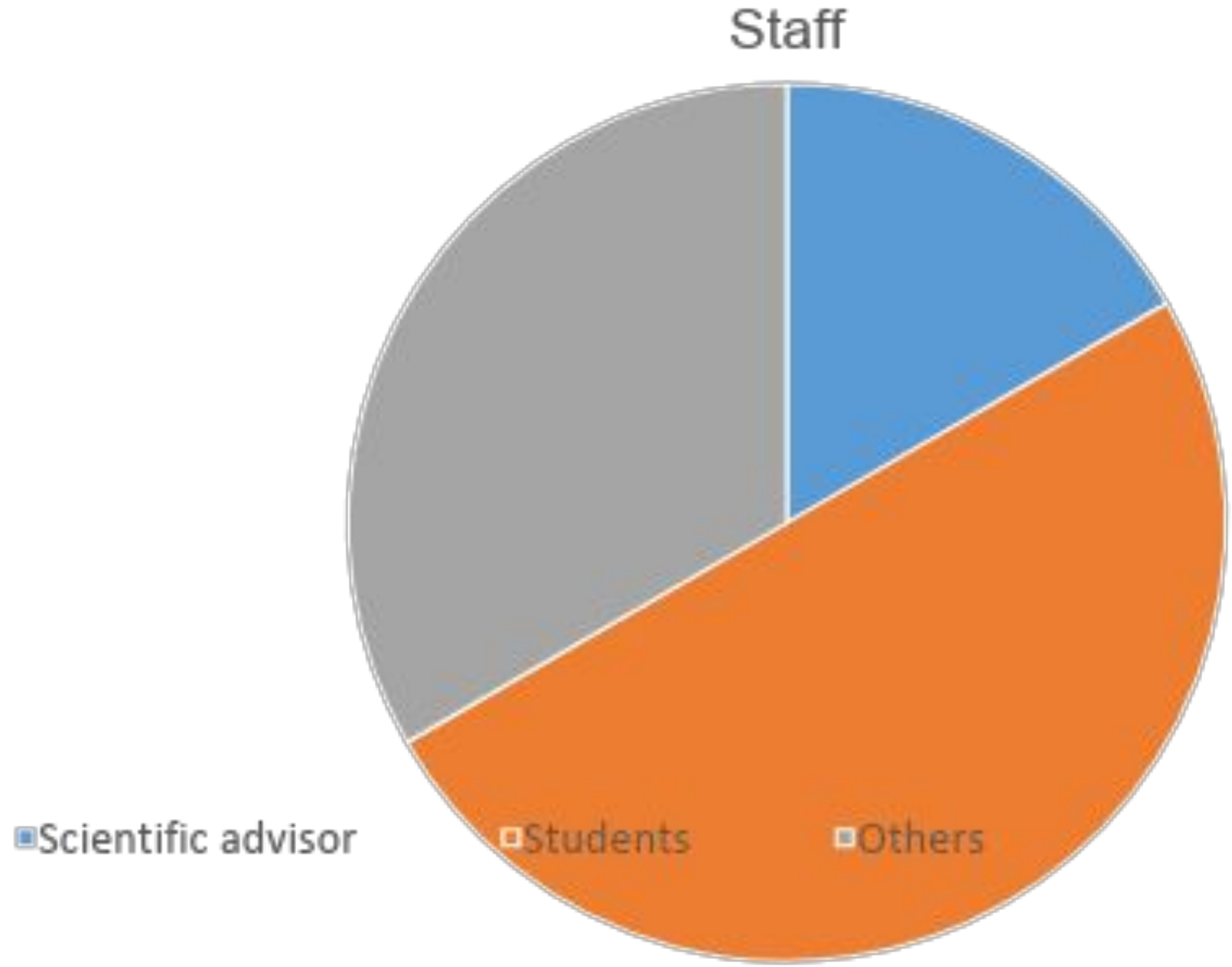


Fig. 5. Equipment and Materials



Picture 6. Diagram description of financial staff

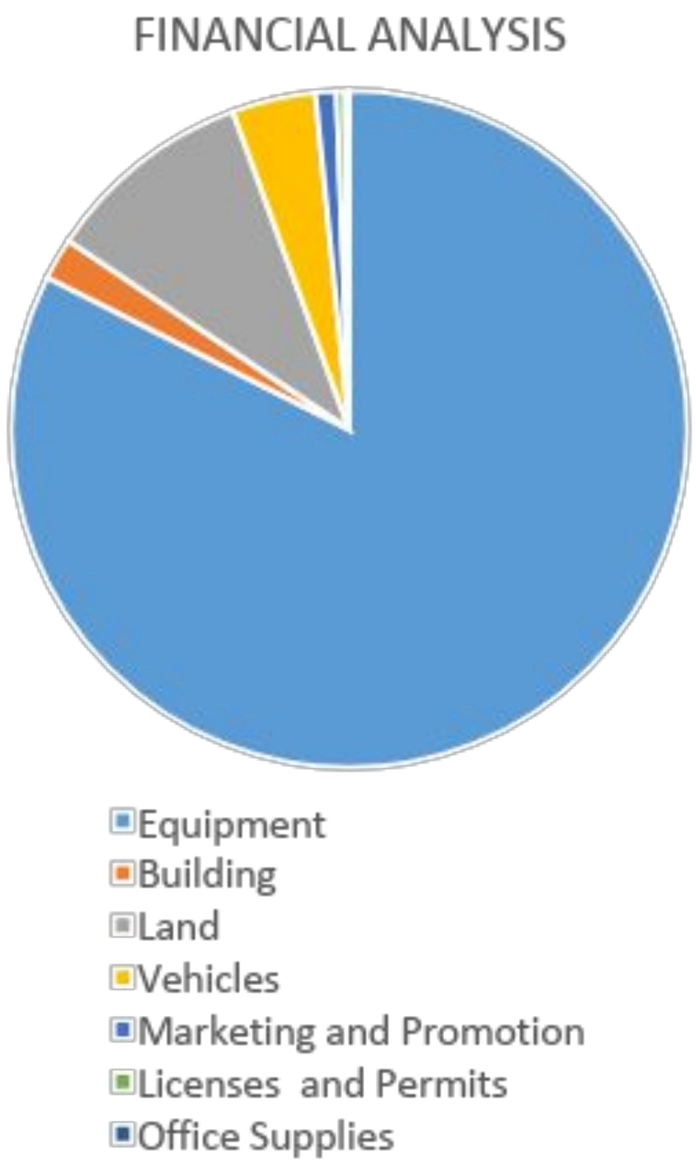


Fig. 7. Diagram description of financial analysis


Спасибо за внимание!!!