DEVELOPMENT AND OPERATION TESTS OF THE TEMPERATURE/HUMIDITY SAMPLE CELL FOR NEUTRON REFLECTOMETRY

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Experimental investigations of materials structure and prototype devices performance at various conditions represent a growing field in science. Concerning neutrons and X-ray scattering investigations this is reflected by the increasing number of proposals in materials science submitted to the international research facilities. As a consequence, specific cells that provide various conditions at the sample are required.

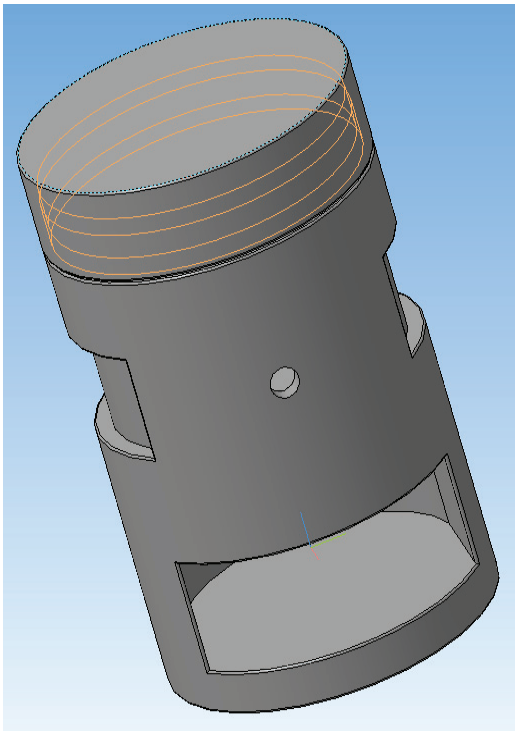

Figure. 1. Principal scheme of the temperature/humidity sample cell.

In this work, we report the development of a special cell with variable temperature and humidity for neutron scattering investigations of hybrid perovskite thin films by neutron reflectometry. The cell will is expected to provide a temperature range from room temperature up to 150ºC and the relative humidity in the range of 40-100%. The principal scheme of the cell is presented in Figure 1 (cell dimensions ~20 × 30 cm). The thin (width < 1 mm) Al windows provide transparency for neutrons, within the heating elements enveloping the cell. The humidity will be controlled by the solutions of selected salts/alkali placed in a special bath located inside. Temperature and humidity are regulated through special entries in the cell case. The cell is planned to be used at the GRAINS time-of-flight neutron reflectometer (horizontal sample plane) at the IBR-2 pulsed reactor.

First tests of the cell regarding heating curves and humidity control will be presented. The measurements of test samples after temperature/humidity treatment are planned. The applications of the cell for studying hybrid perovskite thin film layers degradation at high temperatures/humidity for solar power sources will be discussed.

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