VAPOR ADSORPTION IN CONJUNCTION WITH SAXS UNDER A ROTATIONAL FIELD

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The effect of rotation of vapor adsorption on porous glass is examined by in-situ measurements of small angle x-ray scattering (SAXS). The experiment was conducted and analyzed for both static and rotating conditions. The rotation of the sample was achieved by a specially designed rotating cell described elsewhere; maximum rotational speed was 2,150 rpm [1]. In order to reveal the impact of rotation, a contrast matching technique was applied. Vycor 7930 was used as the adsorbent and CH_2Br_2 as adsorbate having the same electron density with the solid. Pores are partially filled at relative pressure of 0,4. Results obtained from SAXS measurements are presented in Fig.1.

As it is shown, rotation increases the adsorption capacity of the porous matrix by more than 14%. The result confirms that rotation leads to adsorbate contraction and vapor molecules rearrangement; that is, more free space is gained through the mechanism presented in Fig.2. The most interesting outcome is that the specific mechanism is irreversible; the new arrangement of molecules is preserved after rotation (see wet-static after rotation curve in Fig.1).

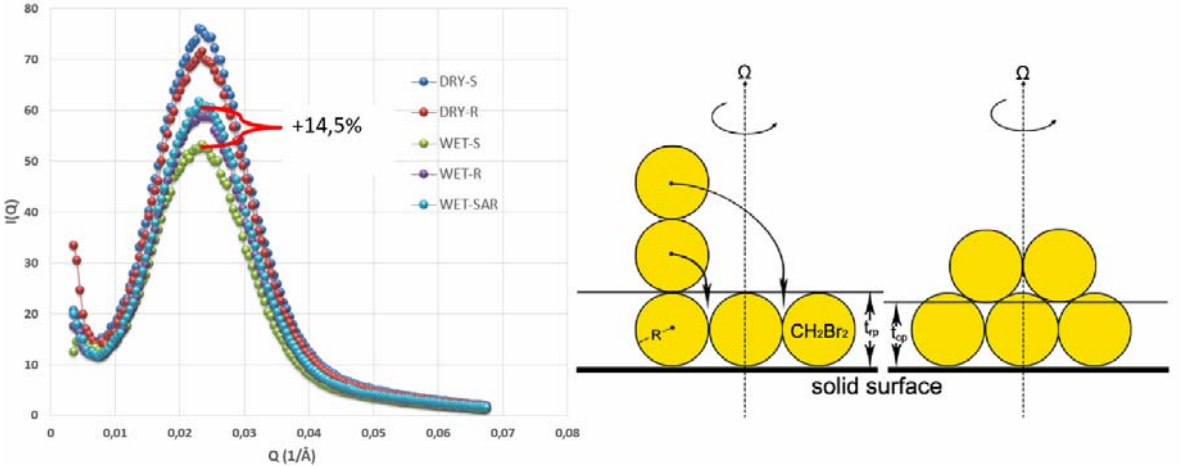

Fig. 1: SAXS spectra of five cases: DRY-S (static); DRY-R (rotating); WET-S, WET-R and WET-SAR (static after rotation). **Fig. 2:** The proposed mechanism of vapor molecules rearrangement.

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References: [1] "A rotating sample cell for in situ measurements of adsorption with x-rays", Ramonna I. Kosheleva et al., Rev. Sci. Instrum. **89**, 123113 (2018).