



# The porosity and structure peculiarities of the nanocomposites based on polyurethane/poly(hydroxypropyl methacrylate) matrix and 1,2-propanediolisobutyl-POSS

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8th International Conference "Nanotechnologies and Nanomaterials" **NANO-2020**  
26-29 August, 2020, Lviv, Ukraine

## Aims

To investigate the influence of the POSS content (1-10 wt. %) on the porosity and morphology of the nanocomposites based on PU/PHPMA semi-IPNs

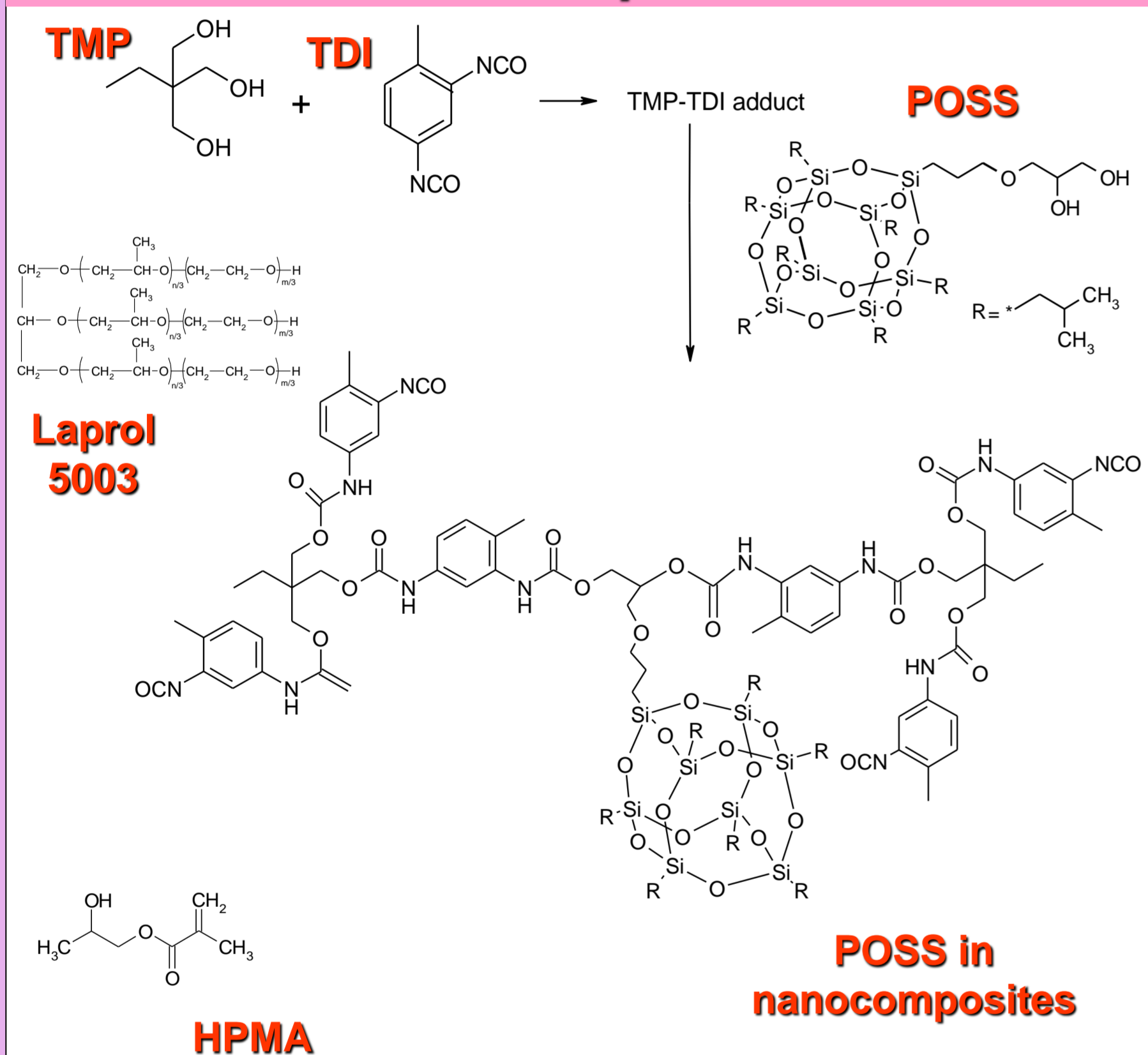


## Methods

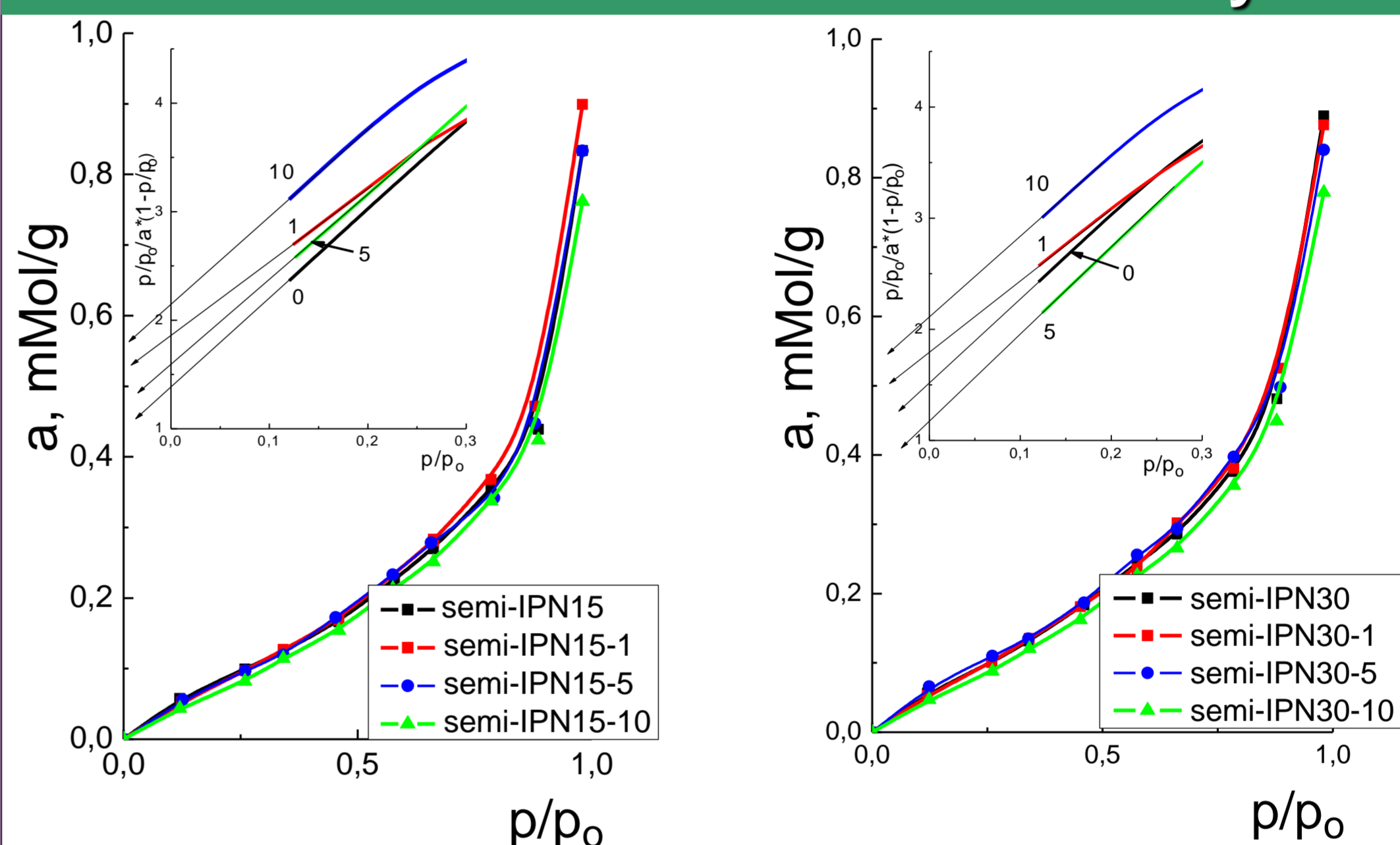
- Vacuum installation with McBain balance (handmade, Ukraine)
- Scanning electron microscopy JEOL JSM 6060 LA (Japan)



## Synthesis of POSS-containing nanocomposites

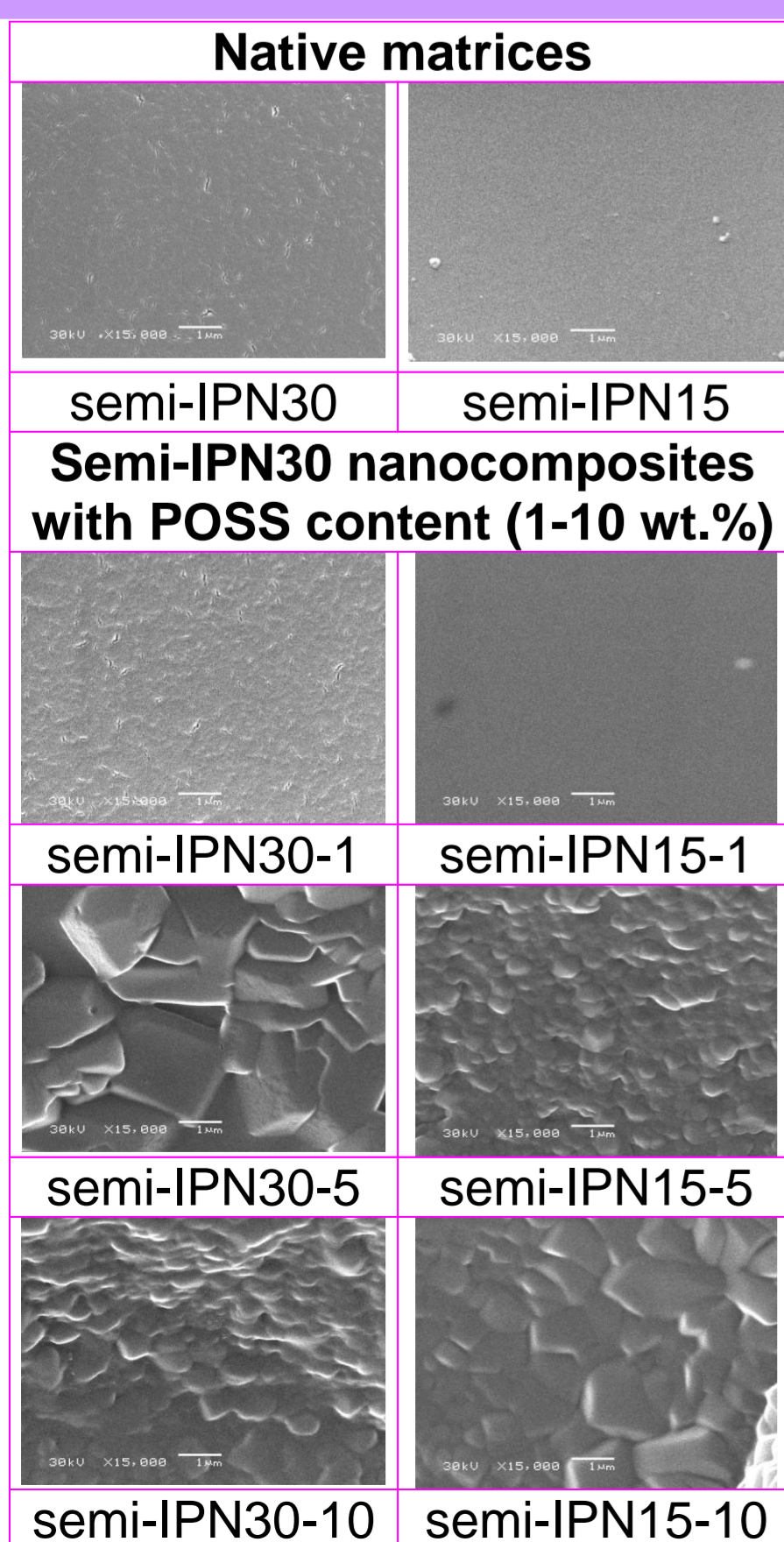


## Results & Discussion: Porosity



The adsorption of methanol vapour by the nanocomposites was investigated using vacuum installation with Mac Ben balance (Fig 1a,b). The porosity, specific surface and average dimension of pores were calculated. The introduction of POSS nanoparticles into semi-IPN30 matrix with amount of 5-10 wt.% lead to decreasing of specific surface and also to decreasing of total volume of pores. The average dimension of nanocomposite's pores were in range of 50-60 Å.

## Result & Discussion: Morphology



## SEM

The morphology of the nanocomposites was investigated by SEM. The semi-IPN15 has the comparatively homogeneous structure, the semi-IPN30 has the heterogeneity with size about 50 nm. The introduction of 1 wt.% of POSS into the matrix semi-IPN30 results in formation of the nanodomains with a size of 50-100 nm. Increasing amount of POSS up to 5-10 wt.% lead to formation of microdomains of 1 mkm and 2-3 mkm. SEM images shows the introduction of POSS in the semi-IPN matrix leads to an increase in the heterogeneity of the material.

## Conclusions

- From the sorption investigation could be conclude, that vapor sorption by the semi-IPN nanocomposites decreases compared to the native matrices (semi-IPN15 and semi-IPN30) when the POSS content more than 1 wt.%, which indicates more dense structure of the obtained nanocomposites. By study the porosity was shown that POSS-containing nanocomposites based on PU/PHPMA semi-IPNs are the materials with transitional pores with size of 50 to 60 Å and could be used as gas barrier membranes.
- SEM studies have shown that POSS, introduced into semi-IPNs based on PU and PHPMA at the stage of PU synthesis, acts as a nanostructuring agent. As a result, nanocomposites with a more ordered structure are formed, which leads to the creation of materials with improved mechanical properties.

*Acknowledges: The authors thank the staffs of the Center Collective Using of scientific Equipments (CCUE) NASU in N.G. Kholodny Institute of Botany of NAS of Ukraine for research by SEM*