Electronic Supplementary Information

POLYMER COMPOSITES PREPARED BY LOW-TEMPERATURE POST-IRRADIATION POLYMERIZATION OF C_2F_4 IN THE PRESENCE OF GRAPHENE-LIKE MATERIAL: SYNTHESIS AND CHARACTERIZATION

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Here we present a reproducibility report for MEGO and MEGO-PTFE composites. For this purpose we have prepared fresh MEGO and compared it with old one synthesized more than 1 year ago (November 2013). For production of MEGO we placed graphene oxide into the same MW oven (Samsung MC32F604TCT, 2450 MHz, 900 W) and warmed it up until thermal explosion of the film (it takes time of about 1-2 minutes).

The most sensitive to materials chemical composition as infra-red (IR) and X-ray photoelectron (XPS) spectroscopies were used for characterization of the materials.

IR spectra of the fresh prepared and old MEGO materials are shown on the Fig. 1. Difference in the background (Fig. 1) is caused by difference in the amount of MEGO film. Taking into account the latter, peak positions and curves behavior of the new and old MEGO demonstrate excellent identity.

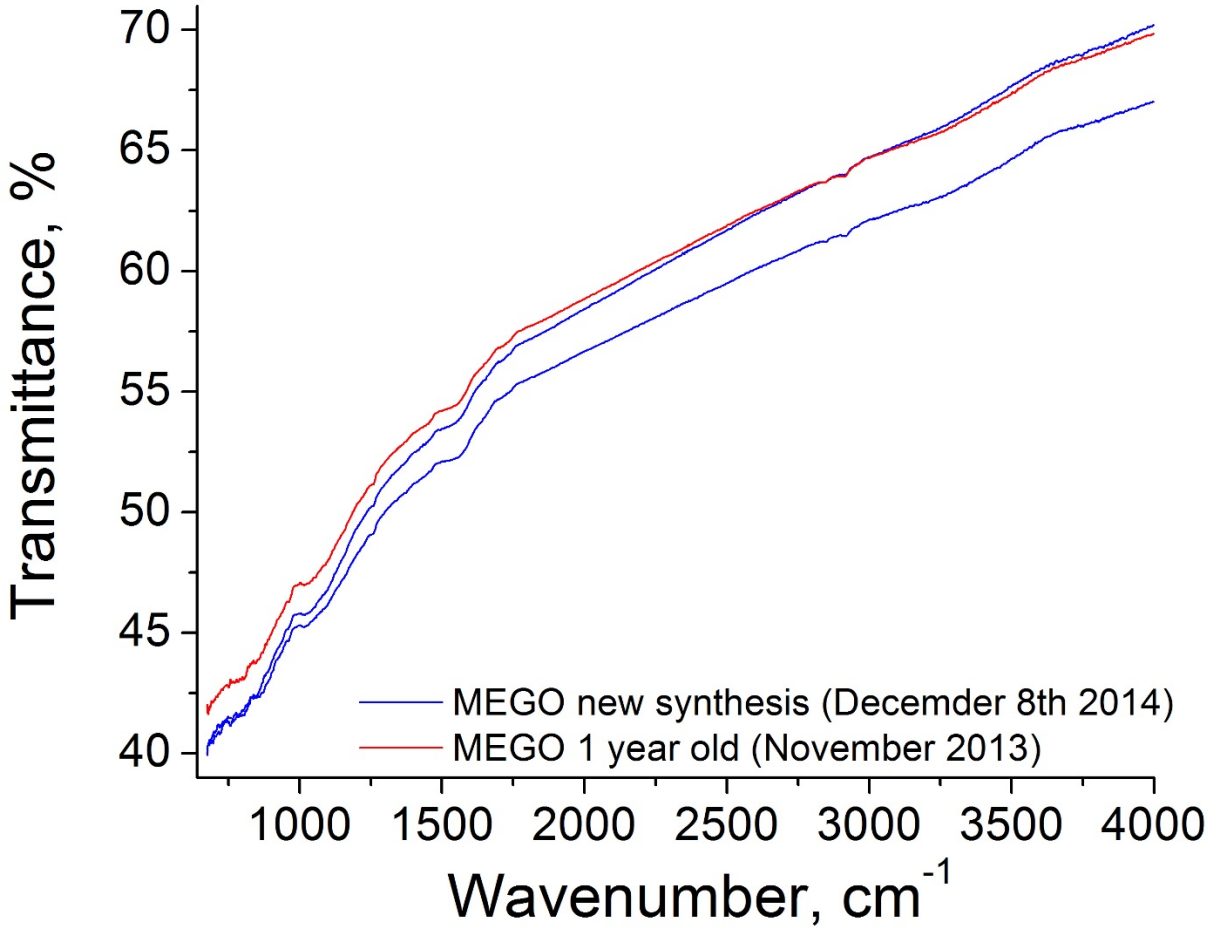

Fig. 1. IR spectra of new MEGO (blue curve) and 1 year old one (red curve).

XPS (Figs. 2 and 3) and XRD (Fig.4) results show absolutely identical behavior too, which is in a good agreement with IR data.

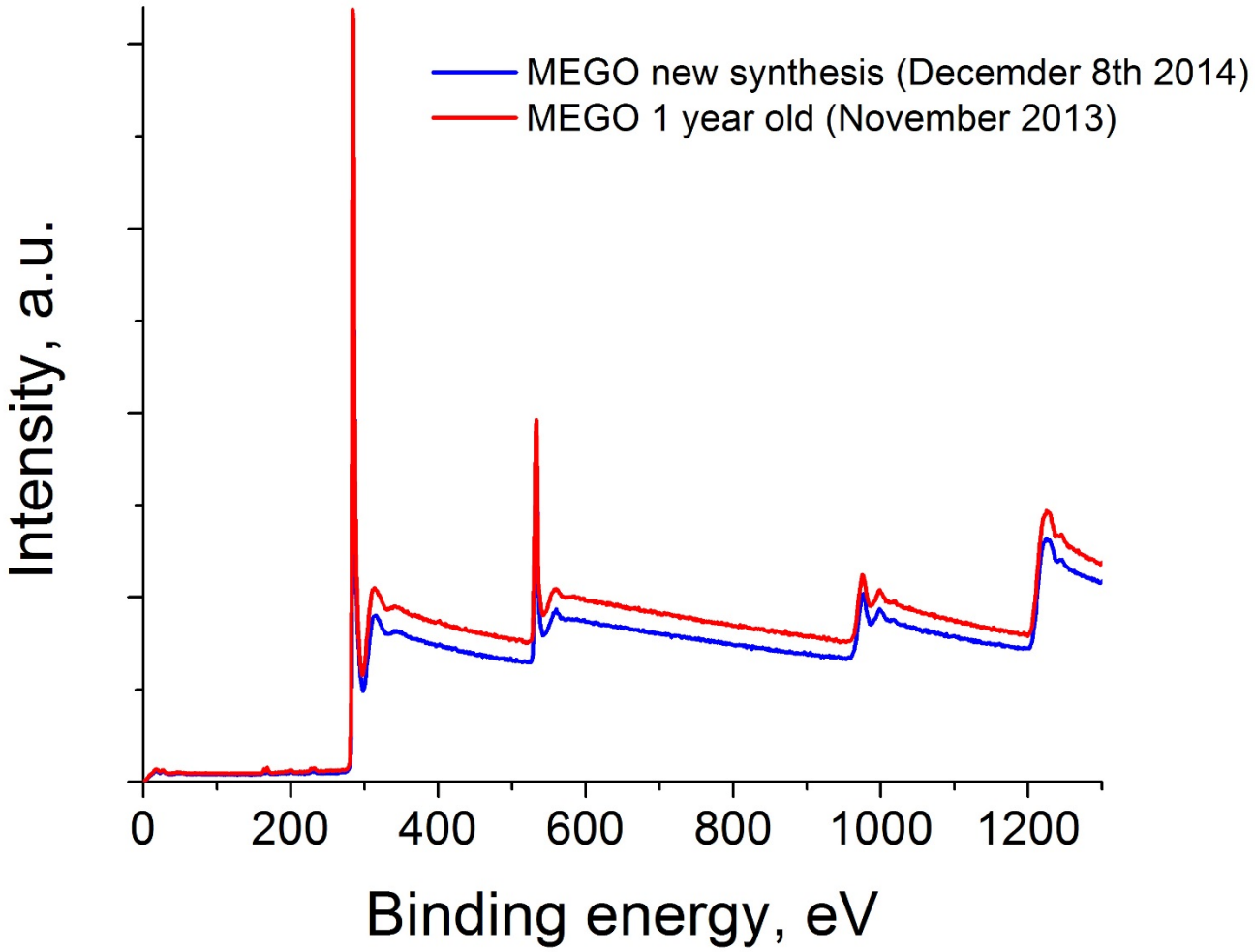

Fig. 2. XPS wide spectra of new MEGO (blue curve) and 1 year old one (red curve).

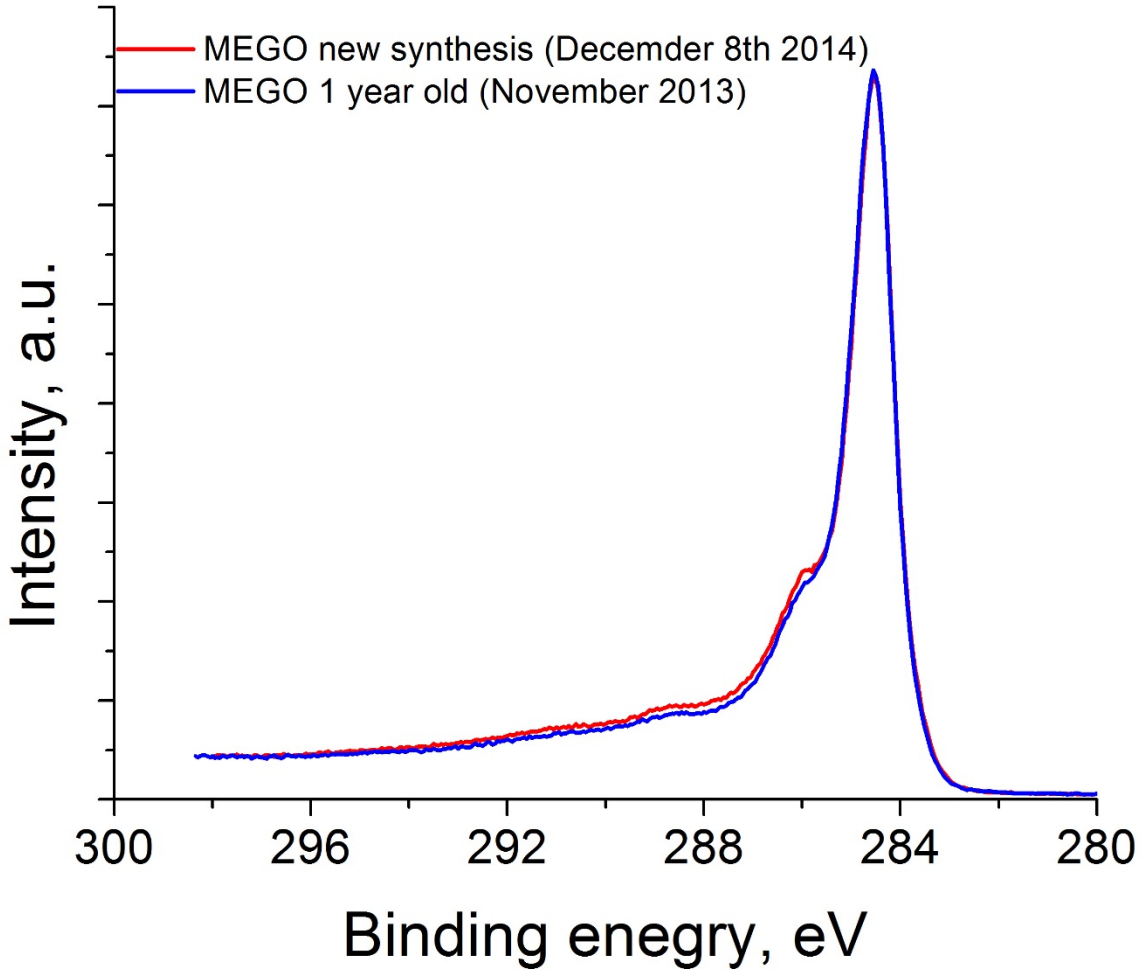

Fig. 3. IR spectra of new MEGO (blue curve) and 1 year old one (red curve).

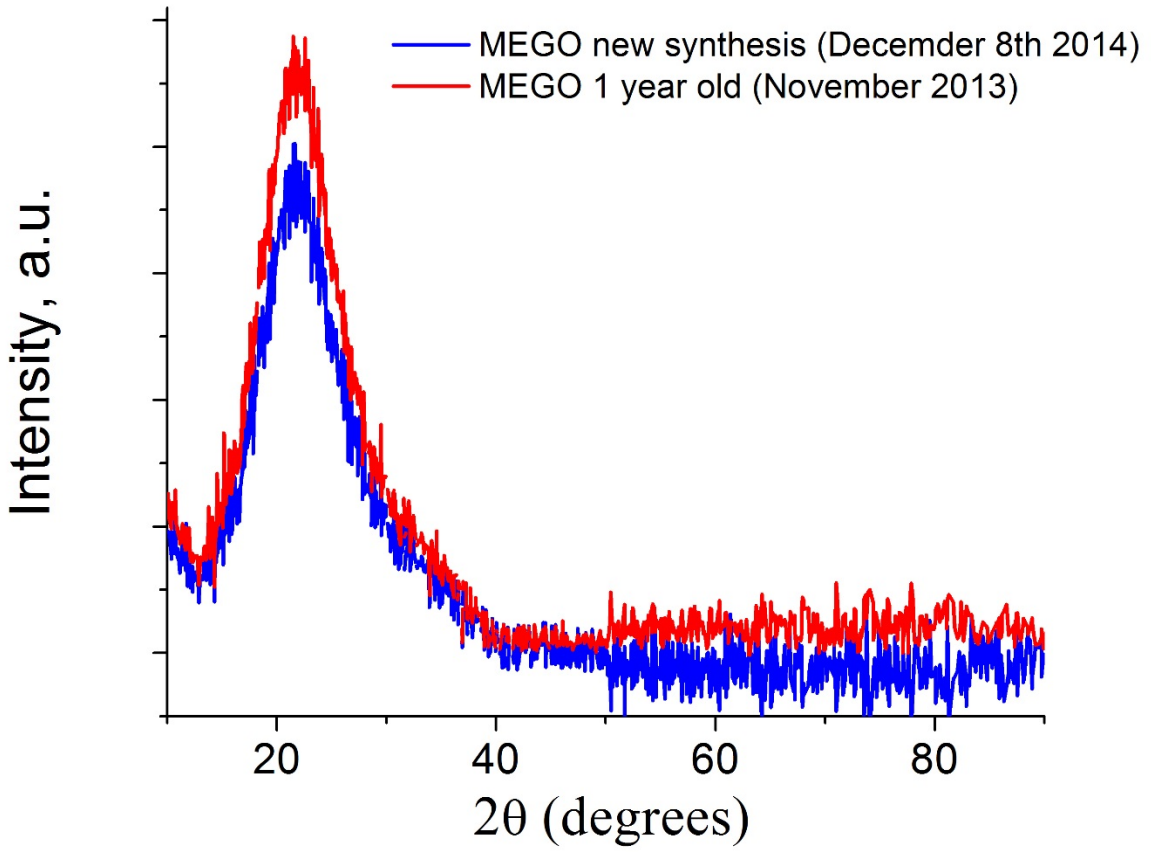

Fig. 4. IR spectra of new MEGO (blue curve) and 1 year old one (red curve).

The XPS data deconvolution results for MEGO and MEGO-PTFE composites is presented in the table below. Fresh MEGO shows the difference of 0.2% in comparison with old MEGO, which is much below than typical XPS measurements error (about 5%). Nevertheless, new PTFE-MEGO synthesis is in a full agreement with previously obtained results.

Surface-layer compositions of MEGO and MEGO-PTFE composites, obtained from XPS spectra

Sample	Content, at. %			
	C	O	F	S
MEGO old	86.3	12.9	0	0.7
MEGO new	**86.4**	**12.7**	**0**	**0.7**
Composite I old	87.6	11.7	0.4	0.3
Composite II old	61.2	8.9	29.6	0.3
Composite I new	**87.6**	**11.7**	**0.4**	**0.3**
Composite II new	**61.2**	**8.9**	**29.6**	**0.3**
PTFE	32.2	0.0	67.8	0.0

Methods

X-ray photoelectron spectroscopy (XPS)

XPS spectra were recorded by using an Axis Ultra DLD (Kratos Analytical Ltd.) spectrometer. Photoemission was excited by monochromatic Al-K_α radiation (E = 1486.7 eV, P = 225 W). The spectra were recorded in a constant transmission mode (160 eV for survey spectra and 20 eV for individual lines). In order to avoid charging of PTFE samples, low-energy excitation was used. Review spectra were taken at a pitch of 1 eV while individual lines, at 0.05 eV. Zone of analysis was about 300 × 700 μm^2 in its size. Residual pressure in the cell compartment did not exceed 10–8 torr.

IR spectroscopy

IR spectra were taken at r.t. with a Fourier spectrometer Perkin Elmer Spectrum 100 equipped with a UATR accessory (Ge crystal, n = 4.0) within the range 4000–675 cm^{-1} at a resolution of 4 cm^{-1}.

XRD analysis

A PANalytical X'Pert Pro MRD 4-axis X-ray diffractometer, coupled with a hybrid monochromator and a 0.27◦ parallel plate collimator, was used.