# W-containing PMMA-based nanocomposite

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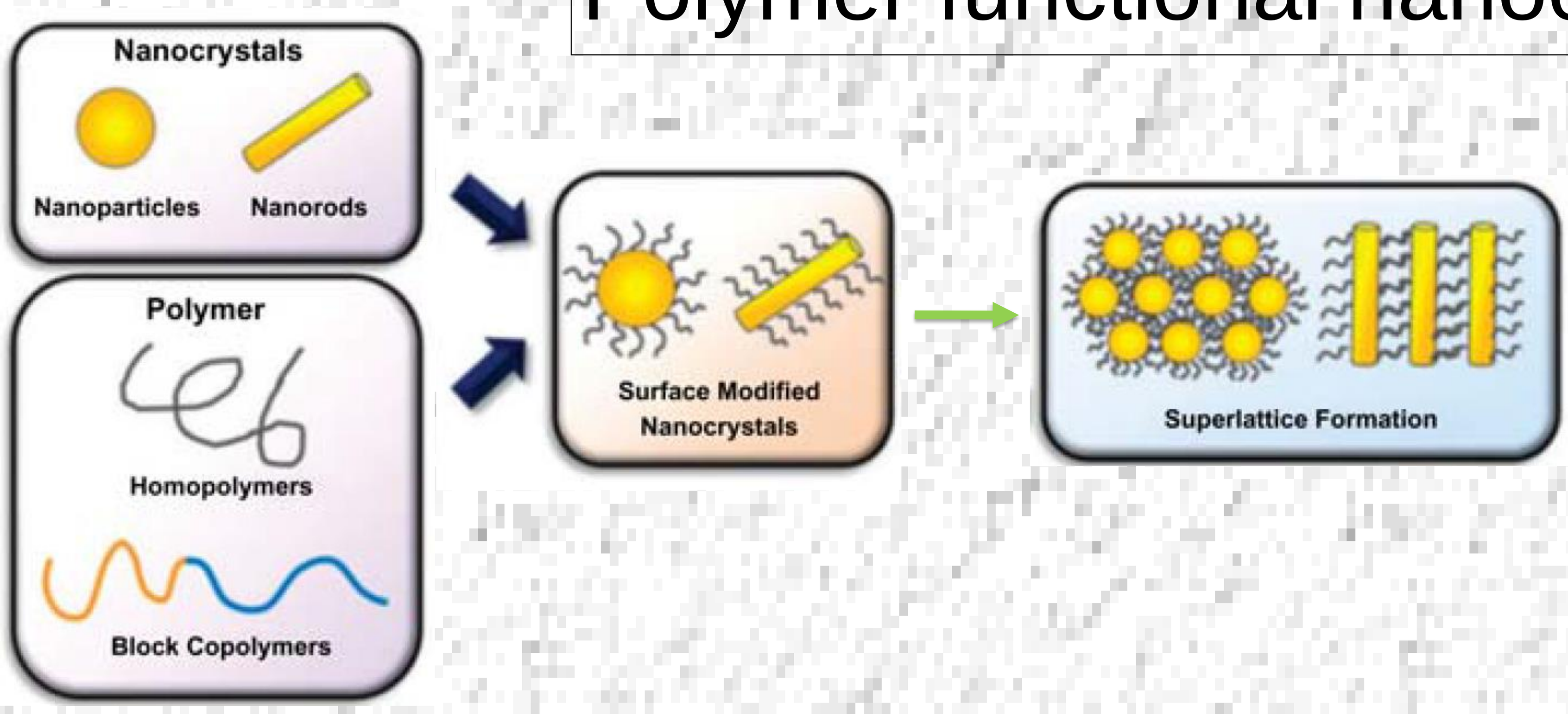
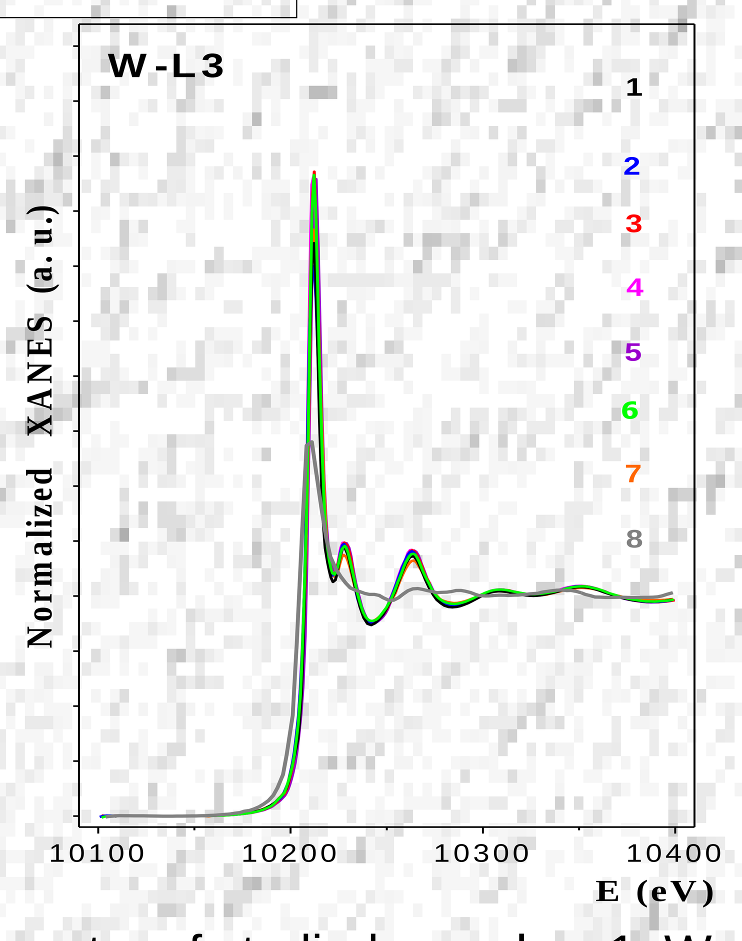
The development of polymer nanocomposites has been an area of advanced scientific and industrial interests in the last ten years in connection with advances in improving the properties of materials based on a combination of a polymer matrix and, as a rule, inorganic nanomaterial. As a result, new materials are formed with improved properties such as mechanical resistance, strength and stiffness, electrical conductivity and thermal conductivity, increased flame retardant properties, lower diffusion coefficient of vapors and gases. Nanocomposites can also demonstrate unique engineering capabilities that guarantee the benefits of creating functional materials with desired properties for specific applications. Therefore, it is promising to use new materials in micromachining to obtain functional microstructures. Some micromachining technologies are based on the use of photo and electronic resists, which are just an organic polymer or prepolymer, and the introduction of inorganic particles into it increases the chemical and thermal stability and mechanical stability of microstructures. One of the promising applications of LIGA technology is the formation of an X-ray detector with high spatial resolution. The introduction of inorganic particles of of the GdO2S2 scintillator with a grain size of several microns into the technological layer of the resist promotes the conversion of X-ray radiation, but significantly limits the spatial resolution. On the other hand, large particles scatter the generated radiation in the visible range of the spectrum. Therefore, we have developed a method of in-situ polymerization of dispersing PMMA particles of submolecular size into an electronic resist, which stimulate the transformation of X-ray radiation into visible light.

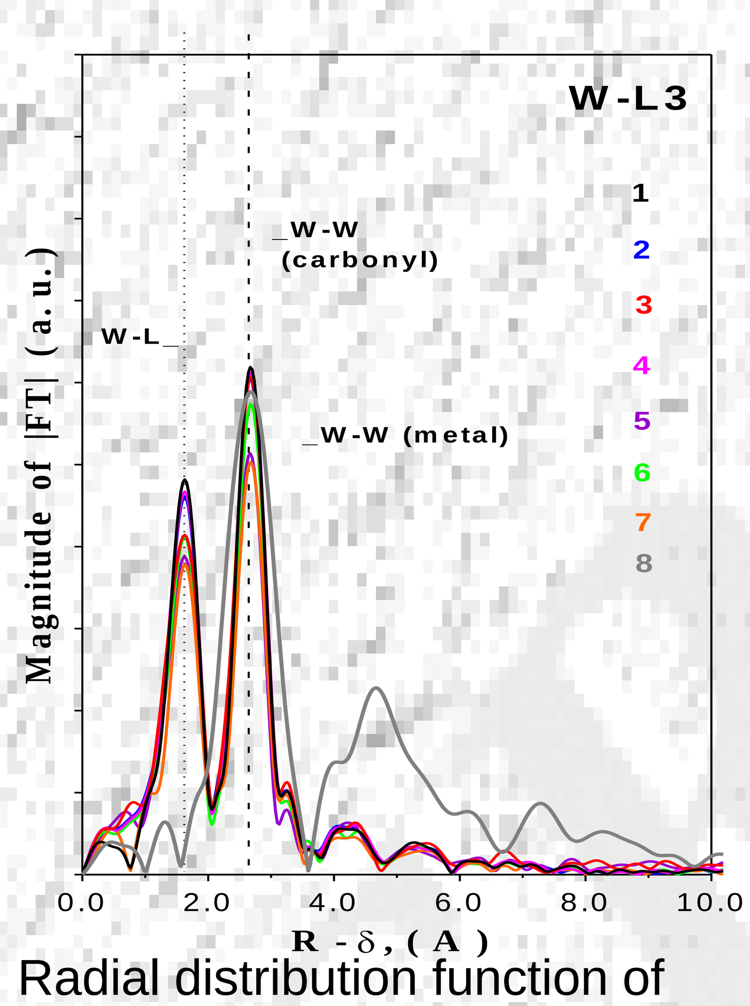
## Polymer functional nanocomposite creation




Hierarchical coassembling of nanoparticles, polymers, and small molecules toward functional nanocomposites.

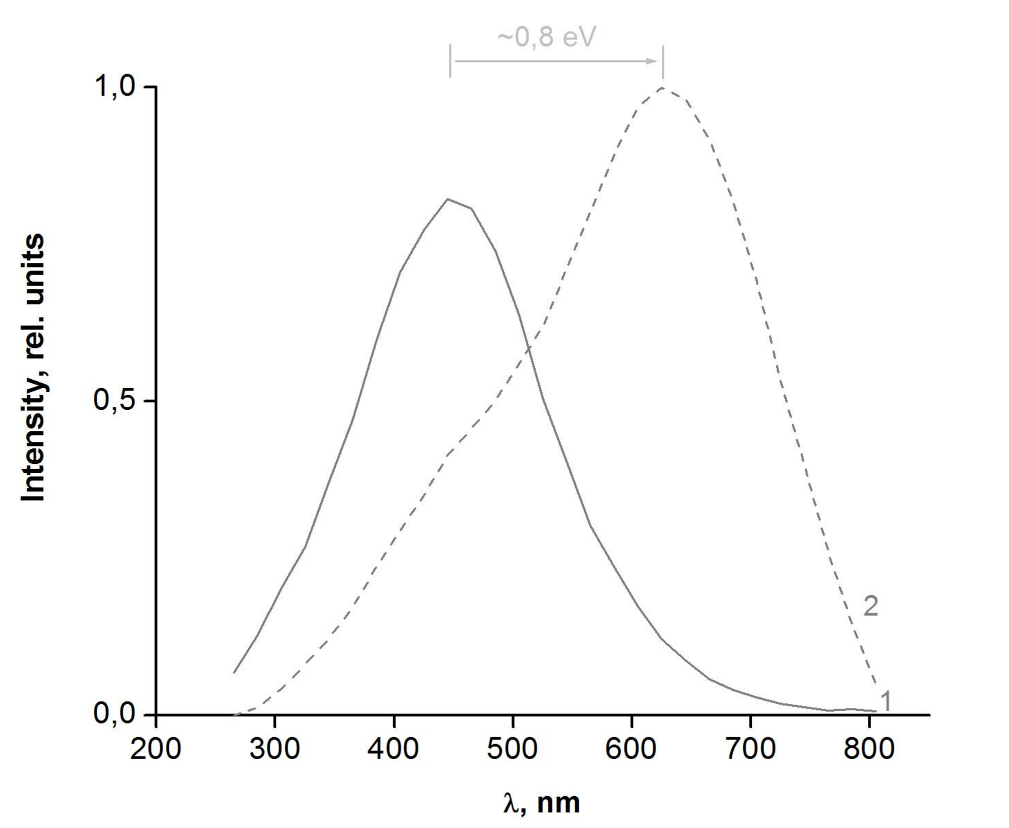



XANES (W-$L_3$) spectra of studied samples: 1. W-carbonyl reper, 2-7. Containing W-carbonyl bond system, 8.W–powder

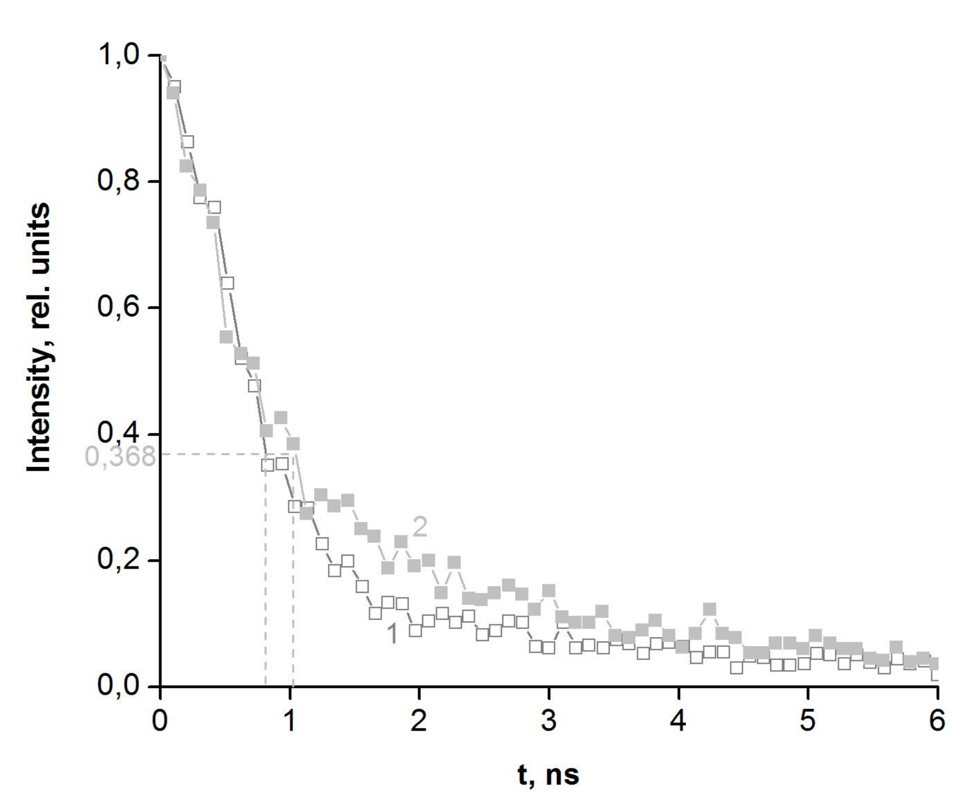



Radial distribution function of atoms (RDFs): 1. W-carbonyl reper, 2-7. Containing W-carbonyl bond system, 8.W–powder

## X-ray excited luminescence of nanocomposite




Measured luminescence spectra of PMMA without tungsten nanoparticles (1) and PMMA with tungsten nanoparticles (2).




Measured luminescence decay in PMMA without tungsten nanoparticles (1) and PMMA with tungsten nanoparticles (2).

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**Conclusion**

The formation of tungsten carbonyl with an admixture of tungsten with a nanoparticle size of 2 to 5 nm was established during the vapor-phase reaction during intercalation into the polymer matrix.

**Litherature**

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