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Silica coating of scintillating nanoparticles

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Scintillating nanoparticles (NPs) may find various applications in medicine, one of them being X-ray induced photodynamic therapy (PDTX) [1]. In general, a material suitable for PDTX is a nanocomposite consisting of silica-coated scintillating core (e. g. Pr³⁺-doped lutetium aluminium garnet) subsequently functionalised with protoporphyrin IX (PpIX) [2] at its surface.

The first important step in the nanocomposite synthesis is ensuring that a uniform silica coating of the core particle was formed. The methods for silica surface modification include both the sol-gel and dense liquid processes as well as their combination. During the sol-gel process, controlled hydrolysis of tetraethoxysilane (TEOS) is performed in suspension of NPs in an organic solvent. The hydrolysed TEOS condenses on the surface of NPs forming a polysiloxane layer. The reaction proceeds at room temperature. However, the dense-liquid process requires careful control of reaction conditions such as the temperature and pH. The formation of silica layer on NPs is ensured by maintaining a solution of sodium silicate on supersaturation level (90 ℃, pH = 9.5). The two step process combining the above mentioned methods was proposed by Liu et al. [3].

In this work we apply the above described silica coating methods on scintillating nanoparticles with three different particle sizes (up to 70 nm). We thoroughly characterise the materials prepared by several techniques, such as the X-ray diffraction, radioluminescence spectroscopy, transmission electron microscopy and surface area measurement. We compare and evaluate different coating methods to identify the one best suited for subsequent functionalization by PpIX.

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References

[1] Bulin, A.-L. et al. (2013). J. Phys. Chem. C 117, 21583–21589.

[2] Bárta, J. et al. (2012). J. Mater. Chem. 22, 16590–16597.

[3] Liu, Q., et al. (1998). Chem. Mater. 10, 3936–3940.

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Author: TOMANOVÁ, Kateřina (Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering)

Co-authors: POPOVICH, Kseniya (Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering); JAKUBEC, Ivo (Institute of Inorganic Chemistry of the AS CR); PROCHÁZKOVÁ, Lenka (Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering); NIKL, Martin (Institute of Physics of the AS CR); MIHOKOVA, Eva (Institute of Physics of the AS CR); Prof. ČUBA, Václav (Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering)

Presenter: TOMANOVÁ, Kateřina (Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering)

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