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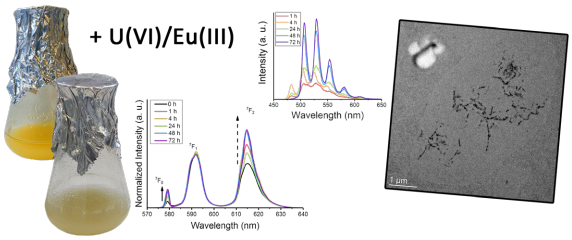

U(VI) and Eu(III) bioassociation behavior and uptake mechanisms of plant cells

JENNY JESSAT[1], HENRY MOLL[1], MARIE-LOUISE BILKE[1], WARREN JOHN[1], RENÉ HÜBNER[2], ROBIN STEUDTNER[1], BJÖRN DROBOT[1], FRANK BOK[3], THORSTEN STUMPF[1] AND SUSANNE SACHS[1]

[1]Helmholtz-Zentrum Dresden-Rossendorf, Institute of Resource Ecology

[2]Helmholtz-Zentrum Dresden-Rossendorf, Institute of Ion Beam Physics and Materials Research

[3]Institute of Resource Ecology, Helmholtz-Zentrum Dresden-Rossendorf

Presenting Author: j.jessat@hzdr.de

For a safety assessment of nuclear waste repositories, it is necessary to consider accident scenarios through which radionuclides (RN) can enter the biosphere up to the food chain via groundwater and soil. It is necessary to generate detailed knowledge about the uptake pathways and the interaction of RN with plants to contribute to the molecular process understanding required for a reliable biogeochemical modeling. We investigated the uptake and immobilization (bioassociation) of U(VI) and Eu(III) as a non-radioactive analogue for trivalent actinides by two typical crop plant cell cultures as model systems: canola (*Brassica napus*) and carrot (*Daucus carota*). For both metals a time- and concentration-dependent bioassociation behavior was observed, which shows differences between the two plant cell types. U(VI) and Eu(III) were used as luminescence probes to explore their speciation in the two systems. Therefore, time-resolved laser-induced fluorescence spectroscopy (TRLFS) was performed under cryogenic conditions. For an investigation of possible uptake pathways of the metals, it must be considered that both U and Eu are non-essential heavy metals for plants. Therefore, it can be assumed that they have no specific uptake pathway into the plant cells. Possible uptake routes are the use of transport systems of essential micronutrients, whose homeostasis can be disturbed by U(VI) and Eu(III), but uptake via endocytosis and mechanosensitive ion channels is also possible. Experiments were performed to investigate whether the metals can be unspecifically taken up into the cells by blocking Ca(II) ion channels with $GdCl_3$. The investigations are supplemented by transmission electron microscopy combined with energy-dispersive X-ray spectroscopy (TEM with EDX mapping), which contribute to an improved understanding of the processes taking place by localizing the metals in the plant cell.