

Synthesis and Characterization of NIR Dye-Doped Nanoparticles for *In Vivo* Tumor Diagnostics

Christine Schneider¹, Sofia Dembski^{2,3}

¹University Hospital of Wuerzburg
Josef-Schneider-Str. 2, 97080 Wuerzburg, Germany
christine.b.schneider@uni-wuerzburg.de

²Fraunhofer Institute for Silicate Research Institute ISC
Neunerplatz 2, 97082 Wuerzburg, Germany

³Translational Center Wuerzburg, Regenerative Therapies in Oncology and Musculoskeletal Diseases
Roentgenring 11, 97070 Wuerzburg, Germany
sofia.dembski@fraunhofer.isc.de

Extended Abstract

Nanoparticles (NPs) are promising tools for a wide spectrum of biological and medical applications. They can be used as carrier and delivery systems for active agents such as biomolecules, dyes and a wide range of sensitive substances and also contribute to the stabilization of these compounds *in vivo*. Real time non-destructive imaging screening *in vivo* can be performed by means of fluorescent based methods. Near infrared (NIR) dyes are perfectly suited for this purpose. They are very promising for tissue labeling because of the fact that in the IR range there is significantly lower background fluorescence than in the visible range. Another feature of tissue is the so called transparent “NIR-window” at wavelengths from 650 nm to 1350 nm. One major disadvantage of most organic NIR dyes is their very fast degradation *in vivo*, so long-term investigations are not feasible. To stabilize these dyes, one option is to encapsulate the dye molecules into a NP matrix.

Here, we present our recent research activities in the field of medical diagnostics concerning the encapsulation of NIR dyes into NPs for *in vivo* tumor diagnostics. Our work is focused on the synthesis and characterization of NP carrier systems on the basis of amorphous silica with mean particle sizes in the range of 60 to 150 nm. These NPs are synthesized via wet-chemical synthesis and doped with different NIR dyes. The choice of silica as a basis of the NPs is motivated by their high biocompatibility, biodegradability and the possibility of surface modifications.

The characterization of the NPs is done by conventional methods such as transmission electron microscopy (TEM) and dynamic light scattering (DLS). Dye-doped NPs were characterized by fluorescence spectroscopy, measuring of absorption and emission with a plate reader and elemental analysis. The focus here was on the stability of the encapsulated NIR dyes under different storage conditions.

In summary, the synthesis of different NP systems on the basis of amorphous silica and the encapsulation of different NIR dyes was successfully demonstrated. With the confirmation of the stability of the encapsulated dyes in the NP matrix they have shown their potential in the field of medical imaging.