DNA of degraded quality, the quantity of which is for sure affected by paraffin hindering its release from the tissues in the lysis step. Therefore, pretreatment of the biological sample, *i.e.* deparaffinization, may assume a relevant role in the subsequent DNA extraction and amplification steps. In this study, five different tissue deparaffinization protocols were compared to determine which was the most appropriate for the aim, exploiting two tissue samples (lung and kidney), FFPE over the next 24 h, taken during autopsies on two male cadavers. The deparaffinization protocols involved the use of the standard procedure with xylene and 100% ethanol and four methods in which paraffin solubilizing solvents were used, *i.e.* chloroform and white mineral oil. Then, DNA extraction was performed by employing the QIAamp DNA FFPE Tissue Kit, modifying the procedure only in the post-lysis step, in which the provided treatment at 90°C for 1 h was omitted, proceeding with incubation at 70°C for 24 h, after addition of Tris 1M to the lysate. Extracted DNA was quantified and normalized to 1 ng/μL and then submitted for amplification with two forensic kits. Amplicons were genotyped in capillary electrophoresis and fragment analysis was conducted with the GeneMapper ID-X v1.6 software. The two panels of Short Tandem Repeats yielded reproducible, albeit partial, genetic profiles, referable to 12/13 loci (molecular weight <300 bp), and showed no significant differences correlated with the adopted deparaffinization procedure. Therefore, while being aware that the study needs to implement the number of samples, it seems reasonable to assume that deparaffinization can also be carried out by procedures other than the standard one, using solvents with low toxic characteristics.

FUNCTIONALIZATION OF NANODIAMONDS WITH HYALURONIC ACID: A STUDY FOR THEIR POTENTIAL APPLICATIONS IN RADIOSENSITIZATION AND SELECTIVE TUMOR DETECTION

S. Sturari[1,2], V. Varzi[1,2], P. Aprà[1,2], G. Tomagra[3], V. Monti[1,2], V. Bincoletto[3], B. Zurletti[3], E. A. Durisi[1,2], S. Arpicco[3], C. Riganti[4], P. Olivero[1,2], F. Picollo[1,2]

[1]Physics Dept., [3]Dept. of Drug Science and Technology, and [4]Dept. of Oncology, University of Torino, Torino, Italy; [2]National Institute of Nuclear Physics, sect. Torino, Torino, Italy
E-mail: sofia.sturari@unito.it

Due to their high biocompatibility and tunable surface chemistry, nanodiamonds (NDs) are widely studied in the biomedical field, with a particular focus in radiosensitization and tumors detection. NDs with hydrogen-terminated surface (HNDs) emerged as potential radiosensitizers, *i.e.*, agents capable to increase the sensitivity of tumour tissues to ionizing radiation. As a result of their negative electron affinity, HNDs were indeed reported to enhance, *via* electronic emission, the production of free radicals, such as hydroxyl radicals (•OH). On the other hand, NDs can host lattice defects called *color centers*: these are characterized by fluorescence properties,[1] which can be exploited for visualizing tumor tissues, in order to facilitate their detection and their complete surgical removal. In these two contexts, surface functionalization with hyaluronic acid (HA) confers to the NDs specific characteristics, enabling their effective applicability. Being highly hydrophilic, HA can be used to avoid NDs aggregation in aqueous media, which would hamper their employment in the water-rich cellular environment. Moreover, in the latter application, decoration of NDs surface with HA is required to target selected types of tumors, such as bladder carcinoma, featured by over-expression of specific HA receptor.[2] Here, we investigated the creation of •OH from irradiated HA-functionalized HNDs (HA-HNDs) in aqueous solution, with the goal of assessing the possibility of using them as radiosensitizers. To this aim, we exploited the hydroxylation reaction of terephthalic acid (TPA), yielding the fluorescent 2-hydroxyterephthalic acid (HTPA), which allows the indirect determination of •OH concentration through fluorescence spectroscopy. Our data show that HTPA fluorescence is not increased neither by HNDs nor by HA-HNDs, whereas it decreases when only HA is present. These results, joined with insights from Dynamic Light Scattering measurements, suggest that the observed behavior could be attributed to interparticle agglomeration in the case of HNDs, probably hindering electronic emission from the nanoparticles. At the same time, for HA-HNDs this could be caused by the free radicals scavenging action of HA. In parallel, we also optimized NDs fluorescence through ion implantation and thermal treatments for their future use as selective probes for bladder cancer.

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CONTINUOUS-FLOW CRYSTALLIZATION OF SURFACTANT-FREE DOPED ZINC SULFIDE NANOPARTICLES FOR OPTICAL BIOIMAGING

F. Tajoli[1], P. Dolcet[2], M. Mognato[3], M. Maggini[1], T. Carofiglio[1], A. Speghini[4], S. Gross[1,2]

[1]Dept. of Chemical Sciences (DiSC), University of Padova, Padova, Italy; [2]Karlsruhe Institute of Technology (KIT), Institute of Chemical Technology and Polymer Chemistry (ITCP), Karlsruhe, Germany; [3]Dept. of Biology, University of Padova, Padova, Italy; [4]Dept. of Biotechnology, University of Verona, Verona, Italy
E-mail: francesca.tajoli@unipd.it

In recent years, microfluidic reactors have become highly attractive devices for synthetizing inorganic nanoparticles (NPs) of high quality. Indeed, microfluidic setups allow a precise control over the final product, in term of size, size distribution and composition, mainly thanks to i) the achievement of homogeneous reaction mixtures within millisecond time scale and ii) the tight and rapid control of the reaction temperature.[1] Within this framework, the room temperature, controlled crystallization of ZnS NPs with an average size of 5 nm and doped with luminescent ions (such as Mn^{2+}, Eu^{3+} and Nd^{3+}) was achieved. Notably, under microfluidic conditions, small and monodispersed NPs were obtained without the use of any ligand and/or surfactant to control nuclei growth and the final size of the NPs. The synthesized nanomaterials were characterized from the structural (XRD, XAS at lanthanide L3 edges), morphological (TEM) and compositional (XPS, ICP-MS) points of view, giving complementary information on the materials' features. In view of potential applications in the field of optical bioimaging, the optical emission properties of the doped nanoparticles were assessed. Furthermore, *in vitro* cytotoxicity experiments were carried out, showing no negative effect and evidencing the appeal of the synthesized materials for potential applications in the optical bioimaging field.[2]

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