POSTDOCTORAL POSITION – 12 months

Starting date: May 2022, 2nd (earlier start possible)

NANTES UNIVERSITY - FRANCE

MANUFACTURING FLUORESCENT NANOPROBES FOR COMPREHENSIVE INVESTIGATIONS OF OSTEOARTHRITIS

Osteoarthritis, leading to joint degradation, has dramatic impact on adult life and affects 3.7 % worldwide and 12.3 % of France population. Such a disease causes high disability and higher risk of mortality. There is currently no curative treatment, which makes joint degradation worsen years after years. Recent investigations have evidenced the important role of cartilage calcification in osteoarthritis development, which consists in the *in vivo* formation of crystalline phosphate deposits like carbonated apatite (CA) and calcium pyrophosphate dihydrate (CPPD) crystals. Both crystals possess distinct biological properties but their activation of OA disease remains unknown since there is no available imaging techniques capable of distinguishing CA from CPPD crystals. To address such fundamental issue and progress in the treatment of the disease, a large consortium made of chemists, biologists, clinicians located in Toulouse, Nantes, Limoges, and Paris (Lariboisière University Hospital) has formed in tight interactions with the international company Canon Medical Systems, developing computerized tomography scanners endowed with multispectral imaging capabilities.

In the framework of this national project funded by ANR, the team at CEISAM Laboratory is involved in the manufacturing and photophysical studies of fluorescent organic nanoparticles (FONs) serving as bright labels, amenable to tightly interact with the surface of calcium phosphate crystals. In this way, long-term follow-up of the *in cellulo* fate of the crystals will be performed by using different techniques of microscopy (electron microscopy, Raman spectroscopy, one and two-photon optical microscopy, correlated microcopy…) to infer the origin of their deleterious action on the growth of cartilage cells.

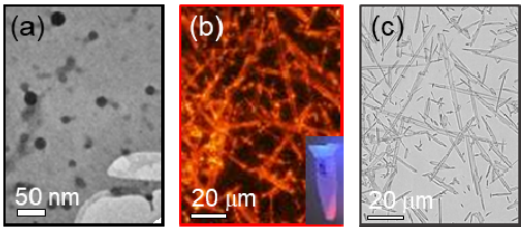

Figure 1. a) TEM imaging of phosphonic FONs. Optical microscopy of crystals after FON staining. b) emission (λ_{exc}@480 nm) (inset: powder emission), c) transmission.

All tasks devoted to the synthesis and photophysical investigations of the chelating FONs will be performed at Nantes University (CEISAM laboratory), having developed original hybrid nanostructures for multimodal imaging, and especially fluorescence microscopy. They will involve tight interactions with the partners (Christèle Combes & Stéphanie Sarda) from CIRIMAT in Toulouse and Lariboisière University Hospital in Paris (Hong-Korng Ea project leader).

The recruited candidate is expected to possess a strong working-together spirit, be open-minded and ready to interdisciplinarity, and have strong expertise in organic synthesis, and either physico-chemical characterizations or nanomaterial fabrication.

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Application will first proceed by e-mail by sending a detailed CV, two letters of recommendation or two names of possible referees.

E. Ishow et al. Patent US 14/218,368, 2014, **2014**. A. Faucon et al. *J. Mater. Chem. B* **2014**, *2*, 7747–7755. A. Faucon et al. *J. Coll. Int. Sci.* **2016**, *479*, 139-149. A. Faucon et al. *Nanoscale* **2017**, 9, 18094-18106. C. Linot et al. *ACS Appl. Mater. Interfaces* **2017**, *9*, 14242-14257. J. Boucard et al., *Small* **2018**, 1802307. J. Boucard et al., ACS Appl. Mater. Int. **2019**, 11, 32808−32814. S. Hoang et al., *ChemPhysChem* **2020**, *21*, 2502-2515.