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FePt nanoparticles of a range of shapes and sizes were synthesised at the Health Biomagnetic Laboratory. The intended outcome of the proposed research was to elucidate quantitative 3D models of small FePt nanoparticles (<100nm). This is not possible using standard high energy x-ray diffraction analysis techniques due to the limitations with the nanoparticle size, and thus requires the use of advanced TEM (Transmission Electron Microscopy) tomography and scanning TEM (STEM) techniques, available at JAIST. The technique of isolating a single FePt nanoparticle and taking a collation of electron micrographs over a tilt series of $\pm 60^{\circ}$ with 2° increments, was adopted to obtain 61 images of the nanoparticle. Data was acquired from the following nanoparticles; FePt octopods, Fig 1a. (20nm), nanocubes (9nm) and spheres (8nm) and 3D reconstructions were successfully obtained using the Hitachi reconstruction software. From these surface and volume reconstructions of the nanoparticles the morphology, presence of surface strain, vacancies and defects within the nanoparticle can be identified. Also, complementary atomic structural information on the periodical arrangements of Fe and Pt within the nanoparticles was achieved through the use of STEM-Energy Dispersive Spectroscopy (EDS) mapping. Slices through the FePt octopod, enabled the whole internal structure to be analysed, Fig 1a., and the distribution of Fe is represented in red and the Pt is represented in blue, Fig.1b. Additionally, composition and chemical surface results of these nanoparticles were acquired through the use of ICP-AES (Inductively Coupled Plasma Atomic Emission Spectroscopy) and XPS (X-ray Photoelectron Spectroscopy) analysis.

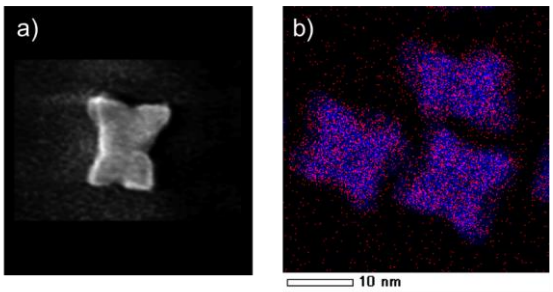

Fig 1: FePt octopods a) 3D slice b) STEM elemental mapping of Fe (red and Pt (blue)

Working alongside professionals within the field and being giving the chance to develop new skills and techniques through the direct accessibility to the advanced equipment available at JAIST, has enabled me to further my research and enabled results of publishable quality to be achieved. I would most definitely recommend taking part in this scheme and would advise anyone who is to ensure to make the most of the availability of equipment that your host university allows you access to, so that you can expand your range of results and experience.