

2019年度 技術交流助成 成果報告 (海外派遣)

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会議等名称 Annual Conference on Magnetism and
Magnetic Material (MMM 2019)

開催地 Las Vegas, USA

期 日 11/4 - 11/8

1) 会議 (研究会) の概要

The 64rd Annual Conference on Magnetism and Magnetic Material, (MMM2019) was held from 4th to 8th November in Las Vegas, USA. This conference covered wide range of topics in magnetism from non-traditional magnetic materials, new permanent magnet materials, spintronics, magnetic recording to very small scales like nanoparticles and nanowires. In the biomedical application, there are many new researches in the composition and application of magnetic nanoparticles, magnetic technique in immunoassay, coil for transcranial magnetic stimulation etc.

2) 会議 (研究会) で発表した研究テーマとその討論内容

Breast cancer is the most common cancer in women worldwide. For early stage breast cancer patient, breast conserving surgery is a preferable choice because it allows patients to keep as much normal breast as possible. Existing localization tools such as hook wire leads to high re-excision rate. By introducing magnetic technique, location of the magnetic marker injected intratumorally can be objectively identified with a handheld magnetic probe.

A numerical simulation tool has been developed to evaluate the performance of magnetic markers. Based on a backward-facing hook shape design made of stainless steel 304 wire, magnetic field strength induced by the magnetic marker with varies

hook length and separation angle between the hook and the main body is evaluated. Magnetic property of SUS 304 has been discussed. The magnetic susceptibility of the material increases with the amount of pressure applied to the material. SUS 304 wire used for the magnetic marker are made from a draw bench, where diameter of the wire gradually decreases in steps, which makes wire with smaller diameter experienced more pressure than wire with larger diameter. Therefore, the former shows higher magnetic susceptibility. This size effect is an important factor in this study. Dr Kinoshita's research 'Evaluation of magnetic properties in ferromagnetic martensite particles using type 304 stainless steel wire' presented in this conference showed a different angle to discuss the magnetic property of SUS 304 material. The martensite grain in SUS 304 wire is the main reason of strengthened magnetic susceptibility in pressure, and he found a numerical description of the change in magnetization curve of this material.

3) 出席した成果

By attending this conference, I got to know more about ongoing research in magnetism and magnetic materials.

Magnetic nanoparticles are commonly mentioned in the conference. There was a presentation on 'Reconfigurable ferromagnetic liquid droplet' in this conference. In their study, magnetic nanoparticles assembled at the water-oil interface can be easily reconfigured into different shapes while preserving the ferromagnetic response. If these droplets can be achieved with biocompatible materials, they could possibly replace a solid marker for localization of breast cancer.

4) その他

This presentation is supported by Nakatani foundation for measurement techniques in biomedical engineering. I am very grateful for the financial support to attend the conference.



Las Vegas city view



During my oral presentation