Zał. 2.

Abstract of doctoral dissertation

CARBON NANOTUBES IN MEDICAL IMAGING

Author: MSc. Eng. Mateusz M. Tomczyk

Supervisor: Ph. D. DSc. Nikodem Kuźnik, prof. of SUT

Medical imaging is an essential element of current medical treatment on each stage of the disease, including prevention, early diagnosis, and therapy. Many imaging techniques use contrast agents to enhance image quality or even target specific organs or tumors. In the present work, I focus on the diagnostic aspect of one of the emerging and up-and-coming platforms – carbon nanotubes.

In the project, multiwalled carbon nanotubes (MWCNT) were developed as contrast agents for magnetic resonance imaging (MRI). MWCNT with endohedral iron nanoparticles were deliberately chemically modified and covalently functionalized with oxygen functional groups. In the research, I found that these nanohybrids achieve record-high relaxivities.

As another element of the research, for the first time, direct covalent addition of fluorescein (Flu) to single-walled carbon nanotubes (SWCNT) was achieved while preserving the fluorescence properties of both fluorophores. The functionalization of SWCNT with Flu opens a way toward dual-modal Vis-NIR fluorescence imaging probes.

In summary, chemical modification of CNT proves to be a valuable and versatile strategy in tuning particular properties of CNT. In the present dissertation, two families of CNT were studied – MWCNT and SWCNT. Appropriate chemical functionalization opens a way for the use of both CNT in medical imaging