

## **Project 4.9 Structure and properties of bundles of carbon nanotubes filled with magnetic halide phases**

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**Institute:** IFPAN

**Unit:** SL 1.4

**www:** <http://www.ifpan.edu.pl/SL-1/html/s-sl14.html>

### **Background:**

The project is devoted to the advanced molecular scale structures, consisting of bundles, 2D and 3D networks of aligned carbon nanotubes filled with highly crystallographically aligned magnetic halide phases. Due to the pressure of the walls of the nanotubes, the classic limits of thermodynamics of crystals can be exceeded using this type of approach. We assume that the oriented filled nanotube bundles will create magnetic 2D and 3D superstructures which will have unusual magnetic properties.

### **Aim:**

The project, will be carried out in the frame of NCN project “In-situ TEM determination of the structure and nanomagnetism of bundles of carbon nanotubes filled with aligned magnetic phases” performed in scientific cooperation with the University of Warwick (Prof. Jeremy Sloan group <https://warwick.ac.uk/fac/sci/physics/staff/academic/jsloan/>).

Research program concerns, investigation of atomic structure of single walled carbon nanotubes (i.e. SWCNTs) filled with transition metals halides, using advance transmission electron microscopy methods coupled with numerical modeling. In following, linking this atomic structure with magnetic and optic properties of such nano-structures. More information about NCN project can be found

<https://ncn.gov.pl/sites/default/files/listy-rankingowe/2021-03-15bhga1/streszczenia/523873-en.pdf>

### **Requirements:**

- the master degree in physics Master’s degree in physics (or an equivalent that qualifies one for PhD studies in physics in the country of issue),
- knowledge of solid-state physics taking into account the atomic structure and band structure as well as diffraction phenomena,
- knowledge about computing modeling of a structure of nanomaterials like carbon nanotubes,
- programming skills in: Python and C++,
- the basics of research using TEM is an additional advantage,
- sufficient proficiency in English

### **Funding:**

Scholarship: grant funding of 5000 PLN per month, before subtracting obligatory employer and employee social security contributions (~15%), for 34 months. Afterwards, standard Polish PhD scholarship (3240 PLN/month net in months 35-48).

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