Synthesis and properties of ferroic nanoflowers

Scientific department: Departament of Ferroelectrics
http://www.ifmpan.poznan.pl/scientificd.php?div=4

Contact details: dr hab. Bartłomiej Andrzejewski,
tel.: 61 86-95-283, e-mail: bartlomiej.andrzejewski@ifmpan.poznan.pl

Introduction:

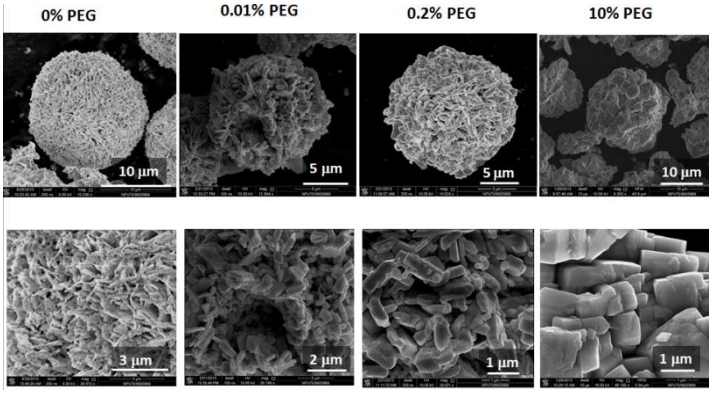
In specific conditions many materials have natural tendency to grow and form nanostructures similar to living plants like, nanoalgae, nanodendrites, nanograss, nanotrees and the most sophisticated forms which resemble nanoflowers. These nanostructures are not only beautiful but also important from the point of view of future applications *i.e*. they can serve as radiators for electronic nanodevices or very effective solar cells (nanoseeweeds, nanotrees), heavy-duty power sources (nanograss lithium batteries) and excellent field emitters, catalysts, biosensors, in-vivo cell tags and also drug delivery media (nanoflowers).

Research project objectives and methodologies:

The aim of this project is to manufacture and study of flower-like ferroics (ferroelectric, ferromagnetic, ferroelastic) and multiferroics nanomaterials. It is expected that fine petals of nanoflowers will exhibit size effect *i.e.* strong dependence of properties on size due to the substantial contribution from the surface energy. Under these conditions:

- antiferromagnetic ferroelectric $BiFeO_3$, should exhibit enhanced magnetization and magnetoelectric coupling
- magnetite Fe_3O_4 (ferrimagnetic), should become multiferroic due to the transition to ferroelectric state forced by the size effect

The flower-like materials will be studied using following methods: SEM, TEM microscopy (morphology), XRD and SAED electron diffraction (structure), XPS (electronic structure), EDS (composition) and VSM magnetometry and impedance spectroscopy (magnetic and dielectric properties).



Multiferrioic $BiFeO_3$ nanoflowers manufactured by mgr K. Chybczyńska from the Department of Ferroelectrics