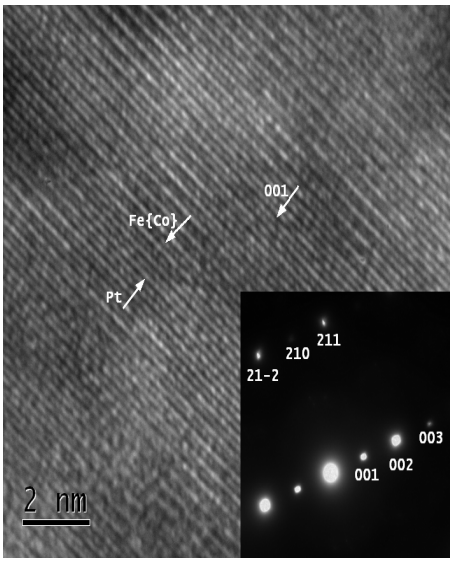
PROGRAMUL DE COOPERARE ELVEȚIANO-ROMÂN
SWISS-ROMANIAN COOPERATION PROGRAMME

Novel FePt-based hard-magnetic materials for sustainable energy applications

Starting Date 01.10.2012

Duration **36** Months

Discipline Materials Science



Main Goals

- Development of new rare-earth-free nano-composite magnets based on FePt made of hard / soft magnetic phases alternating at the nanometer scale as next generation of high-temperature corrosion-free permanent magnets.
- Strategies for implementation of these novel nanocomposite magnets into devices suitable for sustainable energy and automotive applications.

Activities

Nanocomposite magnets are produced by non-equilibrium methods in the shape of ribbons or sintered powders. Structure is investigated by X-ray diffraction and atomically resolved high resolution electron microscopy. Phase evolution with temperature is monitored using differential scanning calorimetry and thermal stability and phase transitions upon heating are investigated by synchrotron radiation powder diffraction at the Swiss Light Source and Elettra synchrotron facilities as well as neutron scattering at Budapest Neutron Centre. Magnetic parameters (saturation magnetization, coercivity, remanence and energy product) are optimized by compositional modulation and thermal annealing. Field-assisted consolidation methods are used for suitably shaping the nanocomposite magnets for applications.

Results – obtained and expected

Exchange-spring nanocomposite magnets with improved high-temperature magnetic performance, corrosion resistance and reduced Pt content, shaped for various industrial applications – automotive and sustainable energy – will be obtained.

Output: **3 ISI papers**: R. Nicula, O. Crisan, et al. “Thermal stability, thermal expansion and grain-growth in exchange-coupled Fe-Pt-Ag-B bulk nanocomposite magnets” J. Alloys & Compounds 622 (2015) 865-870; A.D. Crisan, J. Bednarcik, S. Michalik, O. Crisan, “In situ monitoring of disorder-order A1-L10 FePt phase transformation in nanocomposite FePt-based alloys” J. Alloys & Compounds 615 (2014) S188-S191; A.D. Crisan, F. Vasiliu, I. Mercioniu, O. Crisan, “Role of Ag addition in L1(0) ordering of FePt-based nanocomposite magnets” Philos. Mag. 94 (2014) 174-189. **2 Invited lectures**: O. Crisan at EMRS Fall Meeting, Warsaw, 2014; O. Crisan at JEMS2013, Rhodes, 2013;

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