MAGNETIC MATERIALS AND NANOMATERIALS RESEARCH GROUP

Contact details

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Acronym	**MatMagNano**
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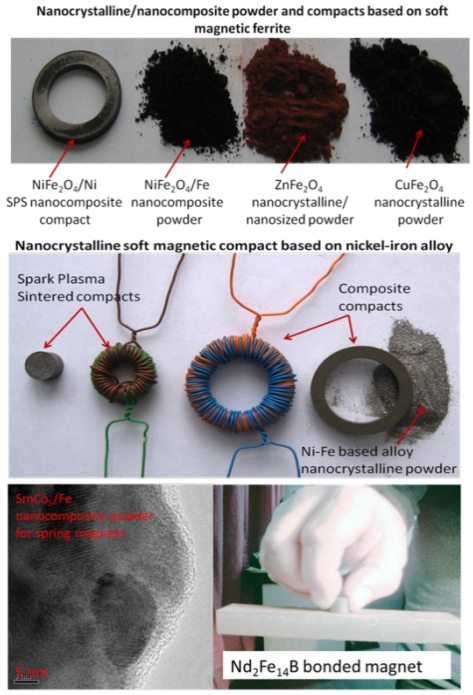

Areas of expertise

Nanocrystalline/nanocomposite magnetic powders produced by mechanical alloying/milling, production of bonded magnets, sintered magnetic materials (soft and hard), obtaining of nanocrystalline compacts (composite and sintered – SPS), fibers based SMC obtained by cold sintering, consulting in magnetic materials, materials characterization, structural, morphological and thermal analysis (X-ray diffraction, SEM + EDX, DTA, DSC+TG).

Team

Assoc. Prof. Dr. Eng. Bogdan Viorel Neamţu, Prof. Dr. Eng. Phys. Ionel Chicinaş, Associate Prof. Dr. Eng. Florin Popa, Associate Prof. Dr. Eng. Traian Florin Marinca; Lecturer Dr. Eng. Calin Virgiliu Prica, Researcher. Dr. Eng. Adriana Lidia Sorcoi, Phd. students: Eng. Ana Cotai, Eng. Katalin Ildiko Szasz, Eng. Loredana Cotojman, Eng. Emrah Karacay, Master students: Eng Cosmin Oprea, Eng. Mariana Sas; Students: Gabriela Cupa, Răzvan Miclea.

Representative projects

„Balance between magnetic properties and electrical properties in soft magnetic composites powders and sintered compacts”, PN-III-P4-ID-PCE-2020-2264/PCE128/2021, https://neamtubogdan.wixsite.com/magelectsmc
„Cold sintered soft magnetic composites based on amorphous ferromagnetic fibres”, PN-III-P4-ID-PCE-2020-0175/PCE 32/2021, https://neamtubogdan.wixsite.com/cs-fsmc
„Alloy/oxide type composite magnetic cores for energy efficient applications in electromagnetic devices”, PN-III-P2-2.1-PED-2019-3763, https://traianmarinca.wixsite.com/300ped
“Fibers based soft magnetic composites prepared by cold pressing and spark plasma sintering”, PN-III-P1-1.1-TE-2016-0649 (2018-2020), https://neamtubogdan.wixsite.com/fsmc
“MagCore-MHF - High magnetic flux density sintered magnetic cores produced from pseudo core-shell/core-shell powders for medium to high frequencies applications”, PN-III-P2-2.1-PED-2016-1816, (2017-2018), http://www.sim.utcluj.ro/contracte/PN-III-P2-2.1-PED-2016-1816/
“Soft magnetic cores via powder metallurgy. Technology development and implementation”, PN-III-P2-2.1-BG-2016-0365, (2016-2018), http://www.sim.utcluj.ro/contracte/PN-III-P2-2.1-BG-2016-0365/
New technology of iron content reduction from quartz sands by magnetic separation, PN-III-P2-2.1-BG-2016-0214, (2016-2018) http://www.sim.utcluj.ro/contracte/PN-III-P2-2.1-BG-2016-0214/
“Researches on synthesis of spark plasma sintered nanocomposite compacts of Permalloy/Fe-Si type using mechanically alloyed powders”, Bilateral cooperation project: France-Romania, (2013-2014)
“Soft magnetic nanocrystalline/nanostructured powders and compacts obtained by mechanosynthesis and spark plasma sintering”, PNII-ID-PCE, (2012)
“Amorphous soft magnetic Fe-based and Co-based powders and cores prepared by mechanical alloying and spark plasma sintering”, PNII-RU-TE, (2012)
“Powders and soft magnetic materials nanocomposites of ferrite/transition metal (MeFe2O4/(Fe, Ni, Fe-Ni-X) type exchange coupled, obtained by mechanical alloying”, PNII-ID-PCE - ID, (2008)

Significant results

The most representative publications of the past 5 years (2019-2023):

1 B.V. Neamţu, M. Năsui, G. Cupa, E. Ware, F. Popa, T.F. Marinca, I. Chicinaş, Effects of adding carbonyl Fe or Mn-Zn ferrite powders to fibre-based soft magnetic composites prepared via hybrid cold sintering/spark plasma sintering, Journal of Materials Research and Technology 28 (2024) 2969–2979. *Q1 ranked*

2 V. Cebotari, F. Popa, T.F. Marinca, B.V. Neamţu, N.A. Sechel, M. Galatanu, A. Galatanu, I. Chicinaş, Obtaining and characterisation of thermoelectric Mg_2Si compound via wet and dry mechanical alloying and spark plasma sintering, Journal of Materials Research and Technology 26 (2023) 8904-8914. *Q1 ranked*

3 B.V. Neamţu, F. Popa, T.F. Marinca, I. Chicinaş, Soft magnetic composites based on Fe fibres and powders prepared by cold sintering process, *Journal of Alloys and Compounds 933 (2023) 167799, Q1 ranked*

4 T. F. Marinca, B. V. Neamţu, F. Popa, A. Z. Mesaroş, I. Ciascai, I. Chicinaş, Novel supermalloy/alumina type soft magnetic composite obtained by reaction spark plasma sintering of Al-Supermalloy (Ni70.5Fe18.8Mo4.7Al6) surface oxidized particles, Journal of Alloys and Compounds 940 (2023) 168899. *Q1 ranked*

5 T.F. Marinca, A.I. Sule, R. Hirian, A.N. Sechel, F. Pop, B.V. Neamțu, I. Chicinaș, Al-Permalloy (Ni71.25Fe23.75Al5) obtained by mechanical alloying… *Advanced Powder Technology 33 (2022) 10364, Q2 ranked*

6 T.F. Marinca, M.C. Sas, A. Mesaroș, R. Hirian, F. Popa, B.V. Neamțu, I. Chicinaș, Al-Supermalloy and Al-Supermalloy@oxide magnetic powder… *Materials Chemistry and Physics 291 (2022) 126727, Q2 ranked*

7 A. Cotai, B.V. Neamțu, F. Popa, T.F. Marinca, O. Isnard, I. Chicinaş, Synthesis and characterisation of amorphous $Fe_{38.5}Co_{38.5}Nb_7B_{15}Cu_1$ powders via mechanosynthesis using industrial raw materials, *J. Alloys Compd 880 (2021) 160497 Q1 ranked*

8 B.V. Neamțu, M. Pszola, A. Opris, F. Popa, T.F. Marinca, I. Chicinaș, Influence of fibres diameter on the AC and DC magnetic characteristics of Fe/Fe_3O_4 fibres based soft magnetic composites, *Ceramics Int. 47 (2021) 1865 Q1 ranked*

9 B.V. Neamțu, A. Irimie, F. Popa, M.S. Gabor, T.F. Marinca, I. Chicinaș, Soft magnetic composites based on oriented short Fe fibres coated with polymer, *Journal of Alloys and Compounds 840 (2020) 155731, Q1 ranked*

10 B.V. Neamţu, A. Opriş, P. Pszola, F. Popa, T.F. Marinca, N. Vlad, I. Chicinaş, Preparation and characterization of soft magnetic composites based on Fe fibres, J. *Materials Science* 55 (2020) 1414–1424, February 2020, *Q2 ranked.*

11 C. D. Stanciu, J.B. Marimon da Cunha, I. Chicinaş, O. Isnard, Structural, magnetic and Mössbauer spectroscopy characterisation of the Fe-15 wt. %Si nanocrystalline powder obtained by mechanical alloying and annealing, *Journal of Alloys and Compounds*, 797 (2019) 865-873, *Q1 ranked*

12 C.V. Pricã, T.F. Marinca, B.V. Neamţu, F. Popa et al., Structural and thermal investigation of Ta-25 % wt. Cu alloy prepared by mechanosynthesis route, *Journal of Thermal Analysis and Calorimetry 136 (2019) 995–1001*, *Q2 ranked*

Significant solutions: Synthesis routes for obtaining nanocrystalline/nanosized, composite/nanocomposite and amorphous magnetic materials

Nanocrystalline/nanosized, composite, nanocomposite and amorphous powder compaction.

Products and technologies (Designed and developed of home-made spark plasma sintering equipment):

1. The group obtained nanocrystalline magnetic powders of Ni_3Fe, Supermalloy (NiFeMo, NiFeCuMo) and developed 2 mechanical alloying method (mechanical alloying combined with annealing, MA with germ of product insertion)
2. Nanocomposite magnetic powders of spring-magnet type ($SmCo_5$/α-Fe, $SmCo_2Cu_3$/α-Fe, $Nd_2Fe_{14}B$/α-Fe, $(Pr,Dy)_2Fe_{14}B$/α-Fe) obtained by mechanical milling
3. Soft magnetic nanocomposite materials, from nanocrystalline powders obtained by mechanical alloying
4. Soft nanocrystalline ferrites obtained by mechanical alloying
5. Nanocomposite powder of soft ferrite/alloy type ($ZnFe_2O_4$/Fe or Ni, $NiFe_2O_4$/Fe etc) and nanocomposite compacts
6. Soft magnetic composite cores based on Fe fibres prepared by cold sintering

Patents/patents pending:

1. P. Cârlan, I. Chicinaş, *Process for preparing the powder of IrAl and $IrAl_3$ intermetallic compounds and irradiation target for industrial gammagraphy obtained there with, Patent Number(s): RO123425-B1*
2. I. Chicinaş, T.F. Marinca, F. Popa, B.V. Neamţu, Process to obtain the n*anostructured powder of permalloy (supermalloy) Rhometal type, Patent Number(s): RO130354-A0; RO130354-B1*.
3. I. Chicinaş, T.F. Marinca, F. Popa, B.V. Neamţu, *Pulberi compozite de tipul Fe sau aliaj feromagnetic/ferită magnetic moale cu structură pseudo „core-shell" şi procedeu de obținere*, OSIM-Nr. A10083/18.12.2015, patent pending.
4. B.V. Neamţu, T.F. Marinca, I. Chicinaş, Magnetic composite cores based on ferromagnetic fibers and method of production, OSIM nr. 137538-A0 (2023), patent pending
5. T.F. Marinca, B.V. Neamţu, F. Popa, I. Chicinaş, Complex composite powders based on Fe and Fe-based alloy, soft magnetic sintered composite compacts with oxide matrix based thereon and process for preparation thereof, OSIM nr. RO137133A0, patent pending

The offer addressed to the economic environment

Research & development	Preparation of nanocomposite/nanocrystalline/nanosized magnetic powders and composite/ nanocomposite compacts. Structural, morphological and magnetic characterisation of powders and compacts. Study of exchange coupling in nanocomposites. Researches on the development of magnetic materials for medium and high frequencies. Production of the bonded magnets, production of the nanocrystalline and nanostructured powders by mechanical alloying/milling and reactive milling, production of magnetic cores (sintered and composite), specific measurements, structural analysis, SEM and EDX analysis.
Consulting	Soft and hard magnetic materials, magnetic hysteresis measurement in DC & AC (up to 10 kHz) for permanent magnets & magnetic cores, mechanosynthesis, reactive milling, X-ray diffraction, SEM+EDX
Training	Lectures in: magnetic materials, mechanosynthesis, XRD, SEM, EDX, DSC-TG. Coordination for PhD projects related to elaboration of magnetic powders produced by mechanical alloying, bonded magnets, sintered soft&hard composites&nanocomposite magnetic materials.

Last update on February 2024