



Anisometric permanent hybrid magnets based on inexpensive and non-critical materials

Fact Sheet

Project Information

AMPHIBIAN

Grant agreement ID: 720853

[Project website](#)

DOI

[10.3030/720853](https://doi.org/10.3030/720853)

Project closed

EC signature date

14 November 2016

Start date

1 January 2017

End date

31 December 2019

Funded under

INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Advanced materials

Total cost

€ 4 948 707,50

EU contribution

€ 4 948 707,50

Coordinated by

AGENCIA ESTATAL CONSEJO
SUPERIOR DE
INVESTIGACIONES CIENTIFICAS



Spain

Objective

Permanent magnets are crucial in modern technology as they allow storing, delivering and converting energy. They are able to transform electrical energy into mechanical and vice versa, which means that improving their performance entails transforming energy in a more efficient and sustainable way.

The best magnets are based on rare-earths (RE), however, their status as a Critical Raw Material (CRM) has brought forward the realization that it is of great strategic,

geographic, environmental and socio-economic importance to consider alternative magnets that present a reduced amount (or absence) of RE. One of the most sought approaches towards this goal consists on constructing composite magnetic materials magnetically coupled at the interface.

In the framework of the success of a previous European Project (FP7-SMALL-NANOPYME-310516), focused on improving ferrite-based magnets, we developed a low-cost novel approach (Patent P201600092) that exploits the magnetostatic interactions within these composites and that yielded extremely promising results in the form of an experimental proof-of-concept.

The goal of this project is to implement up-scalable and cost-efficient methods for fabrication of ferrite-based dense anisotropic magnets with a 40% enhanced magnetic performance (energy products above 55 kJ/m³) with respect to commercial ferrites. We aim at producing improved magnets that retain the advantages of ferrites –availability, sustainability, cost, recyclability, eco-friendliness- and which have the potential to substitute currently used RE magnets (CRM) in the electric power system.

Our targeted application is an electric energy storage device: we will substitute RE magnets by AMPHIBIAN ones in a demonstrator of a flywheel and evaluate its performance against cost, eco-friendliness and resource efficiency criteria.

Fields of science (EuroSciVoc)

[engineering and technology](#) > [electrical engineering](#), [electronic engineering](#), [information engineering](#) > [electrical engineering](#) > **[electric energy](#)**

[engineering and technology](#) > [materials engineering](#) > **[composites](#)**

[natural sciences](#) > [chemical sciences](#) > [inorganic chemistry](#) > **[alkaline earth metals](#)**

[engineering and technology](#) > [environmental engineering](#) > **[mining and mineral processing](#)**

[natural sciences](#) > [mathematics](#) > [applied mathematics](#) > **[mathematical model](#)**



Programme(s)

[H2020-EU.2.1.3. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Advanced materials](#) MAIN PROGRAMME

Topic(s)

Call for proposal

[H2020-NMBP-2016-2017](#) 

[See other projects for this call](#)

Sub call

H2020-NMBP-2016-two-stage

Funding Scheme

[RIA - Research and Innovation action](#)

Coordinator



AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS

Net EU contribution

€ 865 247,50

Total cost

€ 865 247,50

Address

CALLE SERRANO 117

28006 Madrid



Spain



Region

Comunidad de Madrid > Comunidad de Madrid > Madrid

Activity type

Research Organisations

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Participants (10)



CONSIGLIO NAZIONALE DELLE RICERCHE

 Italy

Net EU contribution

€ 496 375,00

Address

PIAZZALE ALDO MORO 7
00185 Roma 

Region

Centro (IT) > Lazio > Roma

Activity type

Research Organisations

Links

- [Contact the organisation](#) 
- [Website](#) 
- [Participation in EU R&I programmes](#) 
- [HORIZON collaboration network](#) 

Total cost

€ 496 375,00



INSTITUT JOZEF STEFAN

 Slovenia

Net EU contribution

€ 462 246,25

Address

Jamova 39
1000 Ljubljana 

Region

Slovenija > Zahodna Slovenija > Osrednjeslovenska

Activity type

Research Organisations

Links

- [Contact the organisation](#) 
- [Website](#) 
- [Participation in EU R&I programmes](#) 

Total cost

€ 462 246,25



PETROCERAMICS SPA

 Italy

Net EU contribution

€ 386 500,00

Address

VIALE EUROPA 2
24040 Stezzano 

SME 

Yes

Region

Nord-Ovest > Lombardia > Bergamo

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

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- [Website](#) 
- [Participation in EU R&I programmes](#) 
- [HORIZON collaboration network](#) 

Total cost

€ 386 500,00



INSTITUTT FOR ENERGITEKNIKK

 Norway

Net EU contribution

€ 540 342,50

Address

INSTITUTTV 18
2007 Lillestrm 

Activity type

Research Organisations

Links

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[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Total cost

€ 540 342,50



UNIVERSIDAD COMPLUTENSE DE MADRID

 Spain

Net EU contribution

€ 332 240,00

Address

AVENIDA DE SENECA 2
28040 Madrid 

Region

Comunidad de Madrid > Comunidad de Madrid > Madrid

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Total cost

€ 332 240,00



GENERAL NUMERICS RESEARCH LAB EV

 Germany

Net EU contribution

€ 334 550,00

Address

AN DER LEITE 3B
07749 Jena 

Region

Thüringen > Thüringen > Jena, Kreisfreie Stadt

Activity type

Research Organisations

Links

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- [HORIZON collaboration network](#)

Total cost

€ 334 550,00



AARHUS UNIVERSITET

Denmark

Net EU contribution

€ 459 143,75

Address

NORDRE RINGGADE 1
8000 Aarhus C

Region

Danmark > Midtjylland > Østjylland

Activity type

Higher or Secondary Education Establishments

Links

- [Contact the organisation](#)
- [Website](#)
- [Participation in EU R&I programmes](#)
- [HORIZON collaboration network](#)

Total cost

€ 459 143,75



MAX BAERMANN GMBH

Germany

Net EU contribution

€ 483 750,00

Address

WULFSHOF 1
51429 BERGISCH GLADBACH

Region

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

- [Contact the organisation](#)
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- [HORIZON collaboration network](#)

Total cost

€ 483 750,00



ADVANCED DISPERSED PARTICLES SL

Spain

Net EU contribution

€ 242 812,50

Address

CALLE ORO, NUM. 45, NAVE 14, NAVARROSILLOS-POLIGON
28770 COLMENAR VIEJO

SME

Yes

Region

Comunidad de Madrid > Comunidad de Madrid > Madrid

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

- [Contact the organisation](#)
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- [HORIZON collaboration network](#)

Total cost

€ 242 812,50



WATTSUP POWER AS

Denmark

Net EU contribution

€ 345 500,00

Address

SYDHOLMEN 8

2650 Hvidovre 

SME 

Yes

Region

Danmark > Hovedstaden > Københavns omegn

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

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[HORIZON collaboration network](#) 

Total cost

€ 345 500,00

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European Union, 2025