ANNUAL REPORT

SUMMARY 2019
**About ICMAB**

ICMAB is a public and multidisciplinary research center dedicated to cutting-edge research in **functional advanced nanomaterials**, pursuing excellence in the generation and transfer of knowledge, and in the development of scientific and technical tools and methodologies.

Our aim is to create new knowledge and innovative solutions in **some of the biggest and more complex challenges that our society currently faces**: materials for a clean and secure energy, materials for low-cost electronics, and materials for nanomedicine.
Almost 500 ICMAB Members
120 Senior & Postdoc Researchers
9 Research Units
10 Scientific Equipment Platforms

About ICMAB
Our Institute is characterized by its high quality research outcomes and by its highly talented people. By the end of 2019, we counted with 5,383 publications, and more than 164,000 citations.

### Publications in 2019

<table>
<thead>
<tr>
<th>Metric</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Publications</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>Publications with IF</td>
<td>222</td>
<td></td>
</tr>
<tr>
<td>Average IF</td>
<td>6.07</td>
<td></td>
</tr>
<tr>
<td>Publications with IF &gt; 10</td>
<td>30 (14%)</td>
<td></td>
</tr>
<tr>
<td>First Quartile Publications (Q1-SJR)</td>
<td>183 (82%)</td>
<td></td>
</tr>
<tr>
<td>First Decile Publications (D1-SJR)</td>
<td>126 (57%)</td>
<td></td>
</tr>
<tr>
<td>Highly Cited Papers</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Gold Open Access</td>
<td>81 (34%)</td>
<td></td>
</tr>
<tr>
<td>Green Open Access</td>
<td>159 (66%)</td>
<td></td>
</tr>
<tr>
<td>h-index</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Average Citations per Item</td>
<td>30.63</td>
<td></td>
</tr>
</tbody>
</table>

Data from Web of Science (April 2020)
History of publications

And throughout our history:

- Total publications (from 1986 to 2019): 5,383
- Sum of citations: 164,874
- Citing articles: 113,067
- Citing articles (without self-citations): 108,962
- Sum of citations (without self-citations): 147,241
ICMAB articles are published in some of the top Scientific Journals in the world.

In 2019, 30 of our published articles had an IF > 10.
Publications by Gender (2019)

1st Author:
- Women: 37%
- Men: 63%

Last Author:
- Women: 22%
- Men: 78%

Corresponding Author:
- Women: 28%
- Men: 72%
Some of ICMAB’s articles have open access either through open access journals or through freely accessible copies in the Digital CSIC repository.
Highlights Research Line 1 (2019)
Sustainable Energy Conversion and Storage Systems

Energy alignment and recombination in perovskite solar cells: Weighted influence on the open circuit voltage
Energy and Environ. Sci. 12, 1309-1316, 2019

Farming thermoelectric paper
Energy and Environ. Sci 12, 716-719, 2019

Ferroelectricity-free lead halide perovskites
Energy and Environ. Sci 12, 2537–2547, 2019

Role of Manganese in Lithium- and Manganese-rich layered oxides cathodes

Pores dominate ice nucleation on Feldspars
J. Phys. Chem. C 123, 34, 20998–21004, 2019

Giant electrophononic response in PbTiO₃ by strain engineering
Phys. Rev. Lett. 123, 185901, 2019
Highlights Research Line 2 (2019)
Superconductors for Power Applications

Depairing current at high magnetic fields in vortex-free high-temperature superconducting nanowires
Nano Lett. 19, 4174-4179, 2019

Control of nanostructure and pinning properties in solution deposited YBa$_2$Cu$_3$O$_{7-x}$ nanocomposites with preformed perovskite nanoparticles
Sci. Rep. 9, 5828, 1-14, 2019

Accelerated growth by flash heating of high critical current trifluoroacetate solution derived epitaxial superconducting YBa$_2$Cu$_3$O$_7$ films
J. Mater. Chem. C 4748-4759, 2019

Coated conductor technology for the beamscreen chamber of future high energy circular colliders
Supercond. Sci. Tech. 32, 094006 (8pp), 2019
Highlights Research Line 3 (2019)
Oxide Electronics

First-principles theory of spatial dispersion: Dynamical quadrupoles and flexoelectricity
Phys. Rev. X 9, 2, 021050-22, 2019

Independent tunnning of optical transparency window and electrical properties of epitaxial SrVO₃ thin films by substrate mismatch
Adv. Funct. Mater. 29, 1904238, 2019

Plasticity of persistent photoconductance of amorphous LaAlO₃/SrTiO₃ interfaces under varying illumination conditions

Dynamic magnetic properties and spin pumping in polymer-assisted-deposited La₀.₉₂MnO₃ thin films
J. Mater. Chem. C 7, 12633-12640, 2019

Complementary resistive switching using metal-ferroelectric-metal tunnel junctions
Small 15, 1805042, 2019
Organic free radicals as circularly polarized luminescence emitters
Angew. Chem. Int. Ed. 58, 16282 –16288, 2019

Redox active PTM radical dendrimers as promising multifunctional molecular switches
Chem. Mater. 31, 22, 9400-9412, 2019

3,2,1 and stop! An innovative, straightforward and clean route for the flash synthesis of metallacarboranes
Green Chem. 21, 1925, 2019

Carbon-paste nanocomposites as unconventional gate electrodes for electrolyte-gated organic field-effect transistors: electrical modulation and bio-sensing
J. Mater. Chem. C 2019, 7, 14993

Solution-processed thin films of a charge transfer complex for ambipolar field-effect transistors
J. Mater. Chem. C 2019, 7, 1025

Effect of the molecular polarizability of SAM son the work function modification of gold: closed-versus open-shell donor-acceptor SAMs
Adv. Mater. Technol. 4, 1800152, 2019
Highlights Research Line 5 (2019)
Multifunctional Nanostructured Biomaterials

Molecular insight into the wetting behavior and amphiphilic character of cellulose nanocrystals
Adv. Colloid Interface Sci. 267, 15–25, 2019

Non-cytotoxic carbon nanocapsules synthesized via one-pot filling and end closing of multi-walled carbon nanotubes
Carbon 141, 782-793, 2019

Combining magnetic nanoparticles and icosahedral boron clusters in biocompatible inorganic nanohybrids for cancer therapy

Efficient blue light emitting materials based on m-carborane-anthracene dyads. Structure, photophysics and bioimaging studies
Biomater. Sci. 7, 5324, 2019

Enhancing localized pesticide action through plant foliage by silver-cellulose hybrid patches
ACS Biomater. Sci. Eng. 5 (2), pp 413–419, 2019

High-throughput cell motility studies on Surface-bound protein nanoparticles with diverse structural and compositional characteristics
ACS Biomater. Sci. Eng. 5, 5470-5480, 2019

European Projects
1 ERC EUROPEAN RESEARCH COUNCIL
3 MARIE SKŁODOWSKA-CURIE ACTIONS
1 NMBP-TO-IND
1 FET-PROACTIVE
1 EUROFUSION

National Projects
4 CSIC i-LINK+
5 PROYECTOS I+D+I RETOS SOCIEDAD
2 PROYECTOS I+D+I GENERACIÓN CONOCIMIENTO
1 INFRAESTRUCTURAS
1 FGCSIC – CUENTA LA CIENCIA
1 INTRAMURAL

Regional Projects
1 LA MARATÓ TV3
1 FUSIÓ CATALUNYA
1 AJUTS PRODUCTE AGAUR
ICMAB is the people. During 2019, 487 people have been working at ICMAB, either as an undergraduate or MSc student, as a PhD or postdoc researcher, as a technician or maintenance staff, working in administration or project managing, or as a full time scientist.
Scientific staff is formed by the permanent research staff (61), postdoctoral fellows (79), and PhD and Project researchers (157), giving a total of 297 researchers.

The support staff (64) is formed by the technical staff (28), the administration staff, the library staff, the IT department and the maintenance and safety staff (36).

In addition, we have visiting researchers (12), undergraduate (72) and master students (34), and the staff working in spin-offs (8).
More than half of the people that are at the ICMAB throughout the year is less than 30 years old. 43% of the ICMABers are women.
ICMAB is an international institution and our members come from countries all around the world. In 2019, a third of our staff came from abroad.

- PHD FROM ABROAD: 51%
- POSTDOC FROM ABROAD: 58%
- TOTAL STAFF FROM ABROAD: 34%
- TOTAL COUNTRIES: 38
Collaborations worldwide (2019)

- **Total Collaborations**: 2,423
  - **Spanish Collaborations**: 459 in 213 articles (89%)
  - **Catalan Collaborations**: 309 in 205 articles (85%)
  - **International Collaborations**: 1,964 in 166 articles (69%)

Countries: 
- France: 35
- United Kingdom: 33
- Switzerland: 32
- Germany: 30
- USA: 20
- Brazil: 17
- Japan: 15
- Spain: 12
- China: 11
- Italy: 10
- Portugal: 9
- Canada: 8
- Belgium: 7
- Italy: 7
- Australia: 7
- South Korea: 7
- United States: 7
- Russia: 6
- Mexico: 6
- France: 6
- Italy: 5
- Korea: 5
- Mexico: 5
- Italy: 5
- France: 4
- United States: 4
- Canada: 4
- United States: 4
- France: 4
- United Kingdom: 4
- United States: 4
- France: 4
- United States: 4
- France: 4
- United States: 4

[Map showing collaborations worldwide]
ICMAB is one of the 120 CSIC centers. As part of the largest research public institution in Spain, ICMAB Researchers have been able to collaborate with other centers and institutes in order to produce 32 articles through 2019.
Collaborations with other Institutions (2019)

However, collaboration is not limited between CSIC centers. During 2019, ICMAB Researchers collaborated with different institutions more than 2000 times.
Meetings and Advanced Training (2019)

A complete training program is designed for all our staff, and particularly for our researchers and PhD candidates. In addition, our researchers participate in many international conferences to disseminate their research.
Many actions have been taken through 2019 in order to effectively disseminate the knowledge generated at the Institute and increase the public engagement of society.
The outreach efforts this year represented an increase in our audience. Visitors in our website have increased by 64%, and ICMAB Researchers have been featured in:

- >100 Newspapers and websites
- 16 Press Releases
- 4 R+D CSIC Publications
- 3 Radio Sections
- 3 TV Sections
Following the Knowledge Transfer Unit improvement plan developed in 2018, ICMAB has increased its Human Resources by incorporating new experts with strategic capabilities, especially in IP and Public-Private-Projects and International Technology Transfer issues. This effort has resulted in the following outcomes in 2019:

**550.000 €** Income New Contracts

**49.000 €** Income Scientific Services
2019 has been the fourth and last year of the first Severo Ochoa "Center of Excellence" Certificate of our Institute.

The project “Smart Functional Materials for Social Grand Challenges” (FUNMAT), which started in 2016, has enabled us to become one of the top research centers in Spain in Materials Science.
As the last year of the Severo Ochoa program, 2019 showcases the complete growth of the center during these four years. One of the things it has allowed is an increase of our personnel.

### Personnel by categories (2016 - 2019)

<table>
<thead>
<tr>
<th>Category</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Researchers</td>
<td>57</td>
<td>59</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Postdoc Researchers</td>
<td>42</td>
<td>58</td>
<td>58</td>
<td>79</td>
</tr>
<tr>
<td>PhD Fellows</td>
<td>74</td>
<td>97</td>
<td>113</td>
<td>157</td>
</tr>
<tr>
<td>Technicians</td>
<td>25</td>
<td>28</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Management &amp; Administration</td>
<td>25</td>
<td>29</td>
<td>31</td>
<td>36</td>
</tr>
<tr>
<td>Master and Undergraduate Students</td>
<td>55</td>
<td>41</td>
<td>34</td>
<td>106</td>
</tr>
<tr>
<td>Visiting and Spin off Researchers</td>
<td>17</td>
<td>20</td>
<td>17</td>
<td>20</td>
</tr>
</tbody>
</table>
Total Staff (2016 - 2019)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>295</td>
</tr>
<tr>
<td>2017</td>
<td>332</td>
</tr>
<tr>
<td>2018</td>
<td>341</td>
</tr>
<tr>
<td>2019</td>
<td>487</td>
</tr>
</tbody>
</table>
Publications (2016 - 2019)

**ARTICLES**
- 2016: 231
- 2017: 203
- 2018: 226
- 2019: 240

**ARTICLES IN Q1 JOURNALS (%)**
- 2016: 90
- 2017: 84
- 2018: 88
- 2019: 82

**ARTICLES IN D1 JOURNALS (%)**
- 2016: 63
- 2017: 53
- 2018: 72
- 2019: 57

**ARTICLES IN GOLD OPEN ACCESS**
- 2016: 51
- 2017: 53
- 2018: 55
- 2019: 81
European Research Projects (2016 - 2019)

- Not active in 2019
- Coordinated by ICMAB

- FASTGRID
- SMART-4-FABRY
- CAMBAT
- Tmol4TRANS
- DOC-FAM
- MAGNET
- MULTIFLEXO
- BATCA
- NEST
- TUNING COPS
- CARBAT
- KARDIATOOL
- MAGBBRIS
- NANOCOHYBRI
- HTS-FCCbs
- INPHINIT
- SENSE-65
- HERALD
- TO-BE
- EMPHASIS
- TELIOTES
- MaX
- DOC-FAM
- 3D-PRINTGRAPH
- NANO-TER
- SEPOMO

Year:
- 2016
- 2017
- 2018
- 2019

Programs:
- MSCA-IF
- MSCA-ITN
- NMBP
- ERC-StG
- ERC-CoG
- MSCA-COFUND
- FETOPEN
- EURONAMED
- COST
- FEUPROMET
- EIT-RAW-MATERIALS
- INFRAEDI
- REBCO
- FETPROACT
- POCTEFA TNSI
- CERN

Projects:
- PO-TEPA TNSI
- COST
- MSCA-IF
- INFRADII
- 36
Gender Equality (2016 - 2019)

Part of ICMAB’s growth during the 2016-2019 period required for us to work on improving our gender equality.

<table>
<thead>
<tr>
<th>Year</th>
<th>Women (%)</th>
<th>Men (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>2017</td>
<td>42</td>
<td>58</td>
</tr>
<tr>
<td>2018</td>
<td>42</td>
<td>58</td>
</tr>
<tr>
<td>2019</td>
<td>43</td>
<td>57</td>
</tr>
</tbody>
</table>
The competitive budget has been over 60% of the total ICMAB budget for the past four years, representing 62% in 2019.
In 2019, a **56.6 % of the budget** for the research projects is from the European Union, a 35.9 % from the Ministry of Science and Innovation, a 5.1 % are Industry Contracts and a 2.4 % is from the Generalitat de Catalunya.
Social Media (2016 - 2019)

Besides collaboration with classic media channels like TV and Radio, we are committed to scientific divulgation through our social media, which have been showing a consistent growth in the 2016 - 2019 period.

<table>
<thead>
<tr>
<th>Year</th>
<th>Twitter</th>
<th>LinkedIn</th>
<th>Facebook</th>
<th>Instagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1328</td>
<td>1614</td>
<td>761</td>
<td>74</td>
</tr>
<tr>
<td>2017</td>
<td>1752</td>
<td>1860</td>
<td>980</td>
<td>194</td>
</tr>
<tr>
<td>2018</td>
<td>2296</td>
<td>2122</td>
<td>1286</td>
<td>356</td>
</tr>
<tr>
<td>2019</td>
<td>2926</td>
<td>3236</td>
<td>1600</td>
<td>564</td>
</tr>
</tbody>
</table>