Nanouptake COST Action

Overcoming barriers to nanofluids market update: European network of nanofluids research

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COST is supported by the EU Framework Programme Horizon 2020

1 COST Action

2 Nanofluids for energy applications

3 Nanouptake

What is a COST Action

- The **European Cooperation in Science and Technology** (COST) is an **intergovernmental organisation** supporting the **scientific/ technological collaboration** through **networks** (**COST Actions**) and supported by **H2020**

- COST is the **longest-running European framework** supporting trans-national **cooperation networks among researchers, engineers and scholars** across Europe

What is a COST Action

- Network of researchers dedicated to scientific collaboration:
  - Associated to an idea contributing to the scientific, technological, economic, cultural or societal knowledge advancement and development of Europe
  - Multi- and interdisciplinary proposals are encouraged
  - Collaborating in a field of science and technology of common interest to at least 7 COST Members/Cooperating Members (and 50% ITC)
  - Based on a joint work programme lasting 4 years

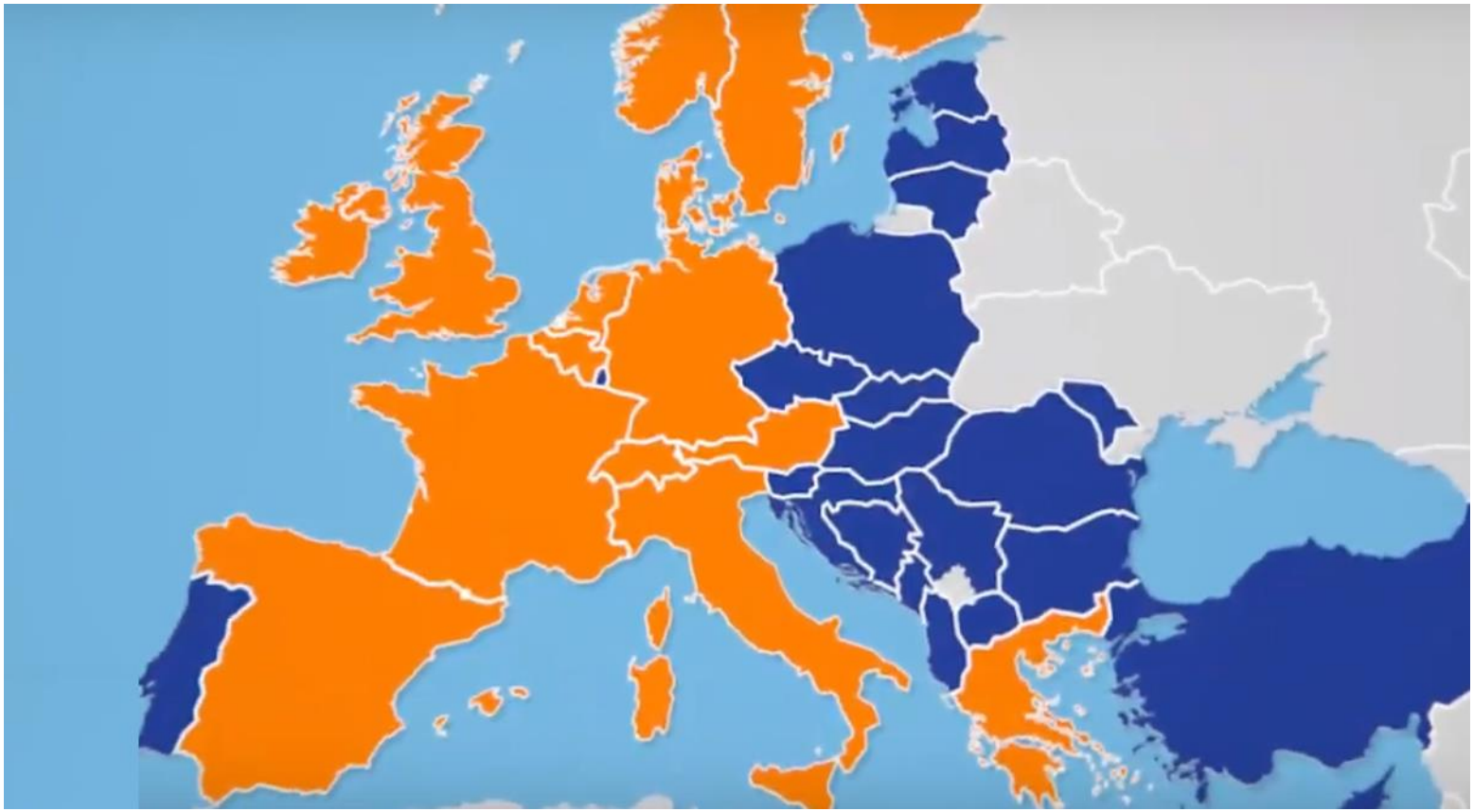
What is a COST Action

- A COST Action is open to all:
  - Science and technology fields (including trans-, and interdisciplinary, new and emerging fields)
  - Institutions (academia, public institutions, SME/industry, NGO, European/international organisations, etc.)
  - Career stages (both young and experienced)
  - COST Members

VIDEO COST
https://youtu.be/SaaAVIcddpA

- 38 COST Member Countries
- 1 Cooperating State
  - Near Neighbour Countries (NNC)
  - International Partner Countries (IPC)

ITC COUNTRIES (Inclusiveness Target Countries) : BLUE



What is financed in a COST Action?

- A COST Action is organised by a range of networking tools:
  - Meetings, conferences, workshops
  - Short-term scientific visits
  - Training schools
  - ITC conference grants
  - Publications and dissemination activities

The average COST Action support is EUR 130,000 per annum for participation by typically 25 COST Members.

How to get a COST Action funded?

- Submit a proposal
- Minimum 7 COST countries and 50% ITC countries
- Successful proposals are available in www cost.eu
- One-step application process
- Next collection date is 5 September 2019
- Two collection dates will take place in 2020 (Spring and Autumn)
- Any questions? www .cost.eu and opencall@cost.eu

BUT ADDITIONALLY….

You can always join an ongoing COST Action

What is expected from a COST Action?

GENERIC RESULTS

- Joint publications
- Joint project proposals
- Dissemination activities: articles, news, social media, etc

SPECIFIC RESULTS

- Deliverables defined by the network at the beginning of the project
- Deliverables defined yearly when the budget&plan is negociated

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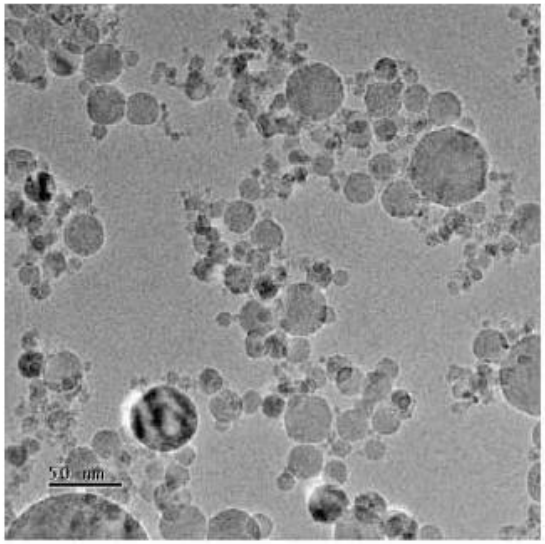
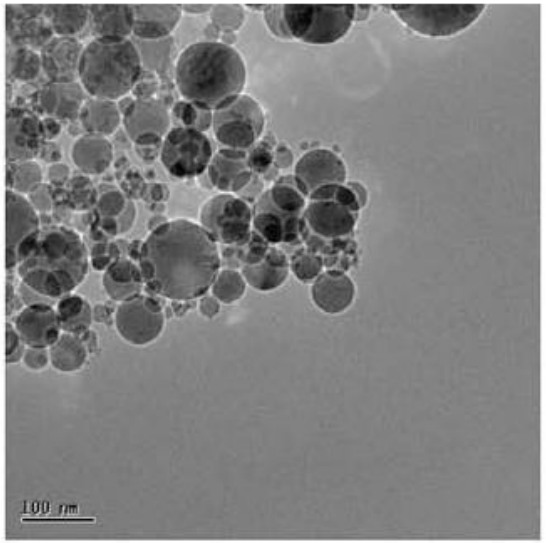
WHAT IS A NANOFLUID?

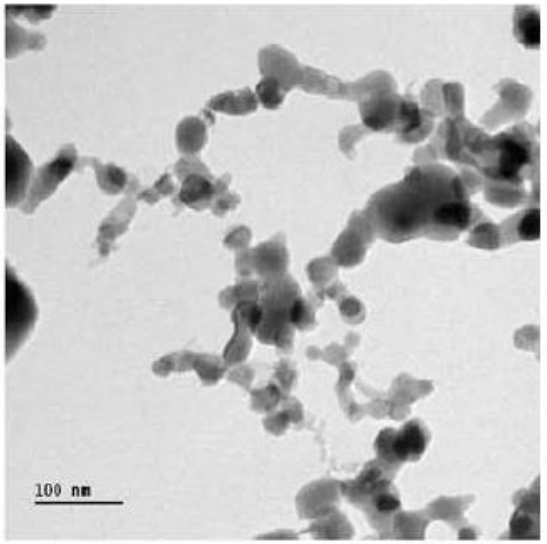
- Nanofluid = Engineered colloidal suspensions of nanoparticles (solid<100 nm)
- Proposed by S.U.S. Choi and M. Masuda in early 90's



a) Al_2O_3 – Nano Arc



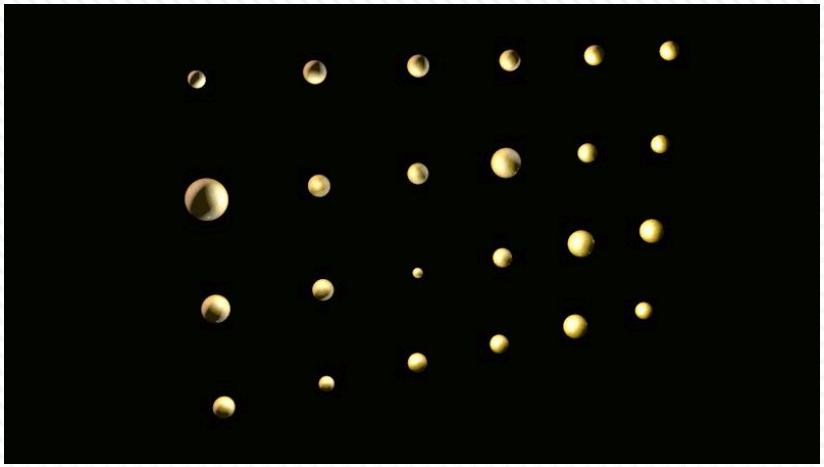
b) Al_2O_3 – Nano Dur



c) BiO_2

WHAT IS A NANOFLUID?

Nanofluids allow to **include a solid into a liquid**, transferring the solid properties (to some extend) and keeping the liquid transport properties (to some extend)



Avoid agglomeration

Advanced heat transfer fluids

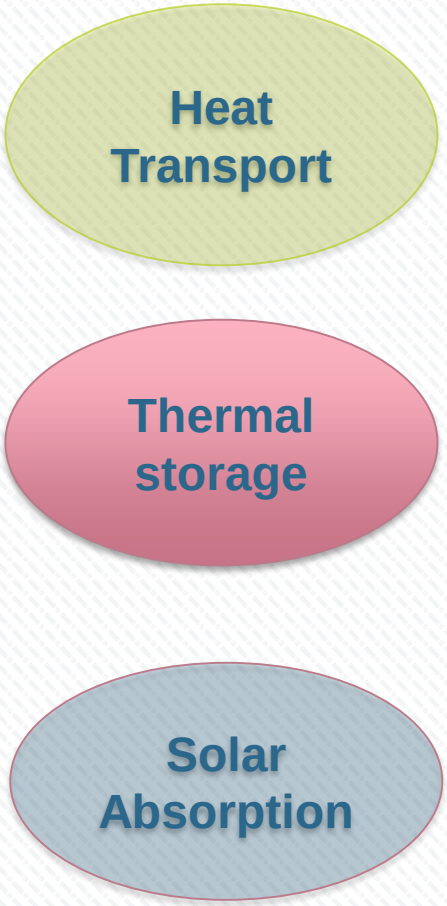
Standard piping

WHAT IS A NANOFLUID?

Base fluid	Operating Temperature
Water	Low T
Paraffins	Low T
Glycols	Low-medium T
Thermal oils	Medium-high T
Molten salts (nitrates, carbonates…)	High T

Nanoparticles	
Metal oxides	SiO_2, Al_2O_3, TiO_2 , Fe_2O_3…
Carbon structures	Carbon black, CNTs, grafene, Graphene oxide
Metals	Au, Sn, Ag, Cu, Zn
Metal alloys	Sn/Pb
Encapsulated	metal@SiO_2, TiO_2 @C

ENERGY APPLICATIONS……



- Thermal nanofluids: increase of heat transfer
- Thermal storage nanofluids: increase of specific and/or latent heat
- Solar nanofluids: direct and volumetric absorption of solar radiation

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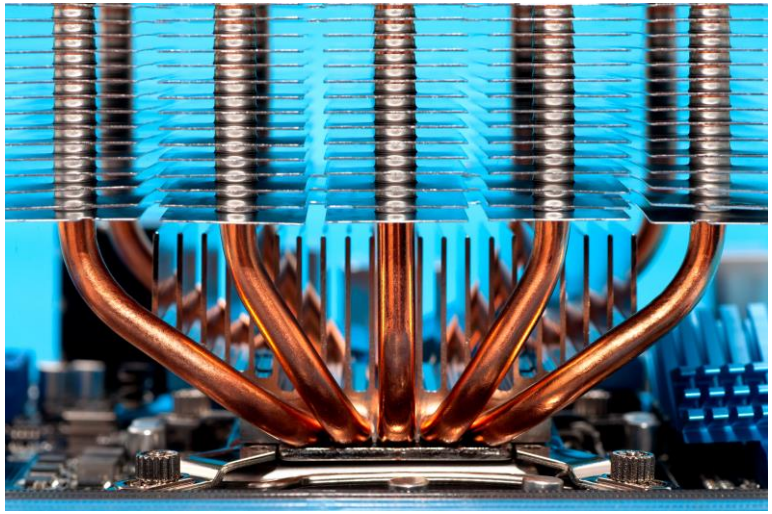
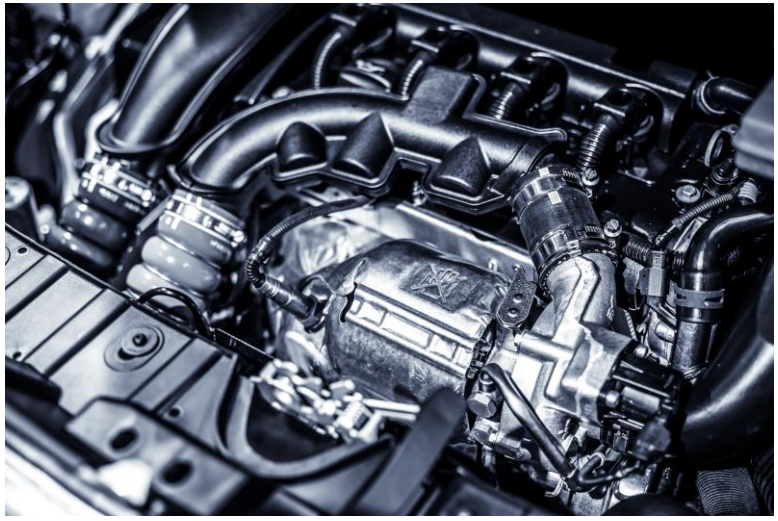
Nanouptake COST Action

- **PROPOSAL**: April 2015 (13 countries, 25 institutions)
- **APPROVAL**: in October 2015 (success ratio 10%)
- **DURATION**: May 2016 to April 2020
- **OBJECTIVE**: Create a Europe-wide network of leading R+D+i centres, and of key industries, to develop and foster the use of nanofluids as advanced HTF/TES to increase the efficiency of heat exchange and thermal storage systems. To develop nanofluids for specific applications to bring them closer to the market

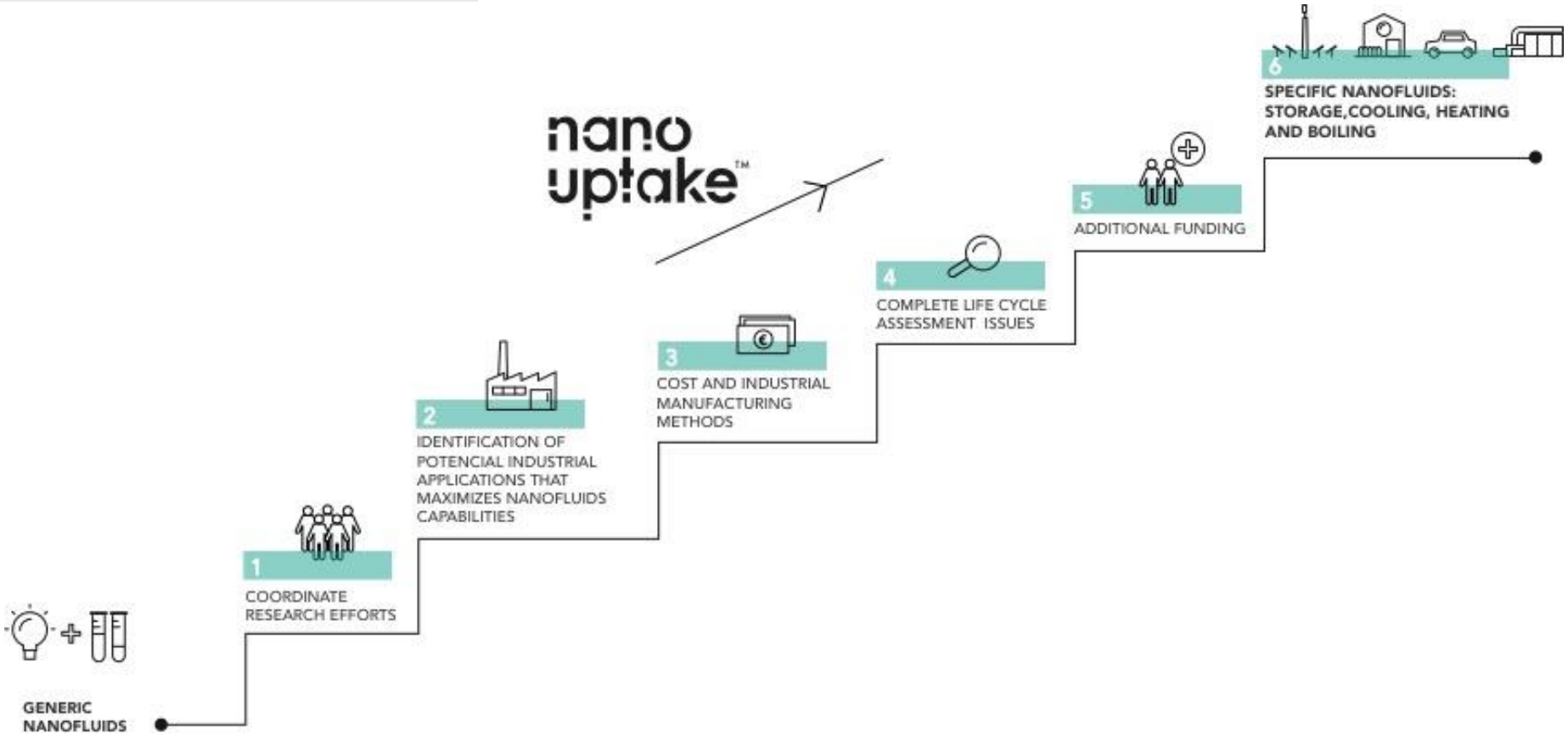
VIDEO : www.nanouptake.eu

Potential applications

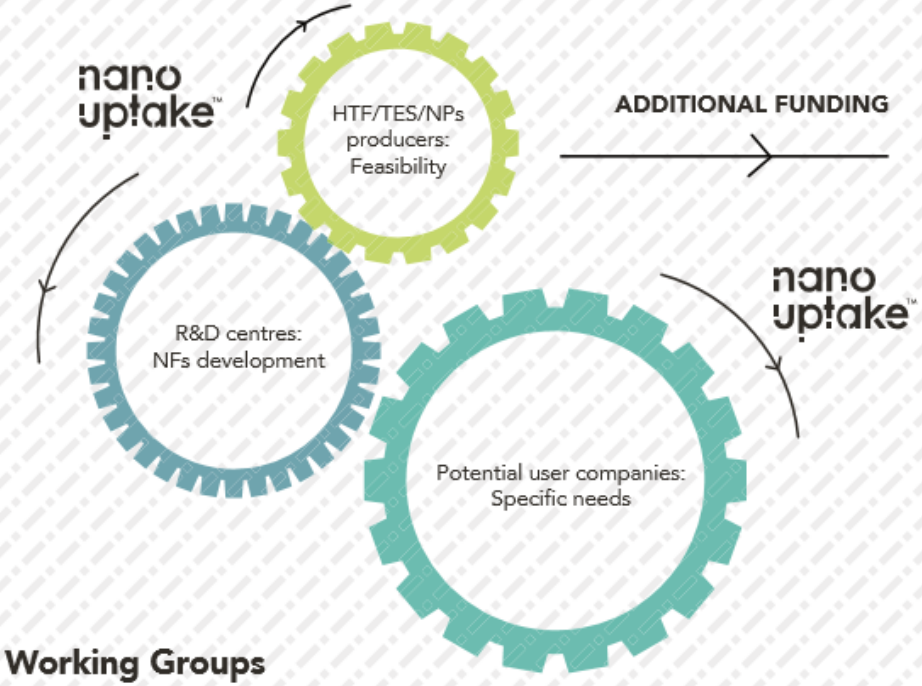




Nanofluid barriers



Working Groups



Working Groups defined by applications

WG1. Heating
NFs based on water, ionic liquids and thermal oils for medium and high temperature transfer processes

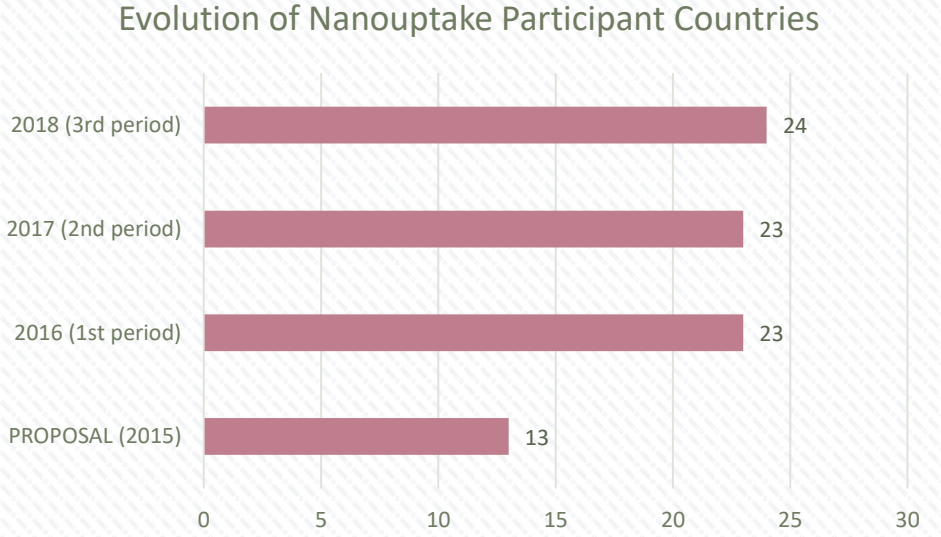
WG2. Cooling
NFs based on water, ethylene-glycol and refrigerant for cooling in power electronic, thermal engines, refrigeration systems etc.

WG3. Storage
NFs based on molten salts and Phase Change Materials for thermal energy storage in Concentrated Solar Power, waste heat, etc.

WG4. Boiling and Solar
NFs based on water for boilers, heat pipes and volumetic solar absorbers

PARTICIPANT COUNTRIES:

- **25/37+1** participants COST (full/cooperating) countries: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, The Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and the former Yugoslav Republic of Macedonia
- **10/20** Inclusiveness Target Countries (ITC) : Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, fYR Macedonia, Hungary, Latvia, Lithuania, Luxembourg, Malta,Montenegro, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia,Turkey

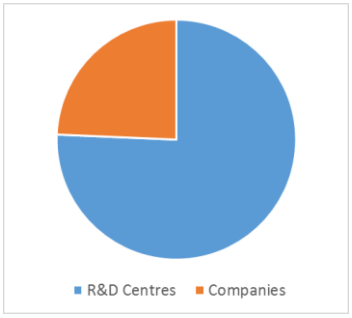


NANOUPTAKE Networking Activities and Participants

1. **Training Schools:** Once per year. Short, intensive courses with high level trainers addressed to new participant
2. **Short Term Scientific Visits:** Participants staff exchange between 2 weeks and 3 months
3. **Working Groups Activities:** Nanofluid development for specific applications. Research centers and companies involved. Meetings, dissemination, conferences, etc
4. **ITC Conference Grants:** grant for PhD or early career investigators from ITC countries to attend to conferences

Participants:

- R&D Centres
- Companies (HTF/NP producers, Potential NF users)



ACTIVITIES PARTICIPATIONS 1st HALF OF THE ACTION:

WORKING GROUP MEETINGS/WORKSHOPS			Participants
1st Working Group Meetings	2016	Castellon (Spain)	83
2nd Working Group Meetings	2017	Lisbon (Portugal)	43
3rd Working Group Meeting 1st European Symposium of Nanofluids	2017	Lisbon (Portugal)	85
4th Working Group Meeting	2018	Naples (Italy)	76

TRAINING SCHOOLS			Number of participants	Number of Countries
1st Training School	2016	Castellon (Spain)	36	14
2nd Training School	2017	Lisbon (Portugal)	33	11

	Number of STSM	Number of Involved countries
Period 1	9 (1/8)	10
Period 2	18 (10/9)	10

ITC GRANTS	Grants	Countries
Second Period (2017-2018)	2	2
Third Period (2018-2019)	3	2

WG: 287 **TS**: 102 **STSM**: 33 **ITC grants**: 8

ACTIVITIES PARTICIPATIONS:

SOME GENERIC RESULTS FOR THE 1st HALF OF THE ACTION:

1. PUBLICATIONS

Type of Publication	Number
Book	1
Book of Abstracts	1
Articles in Journals	21
Congress/Conference papers	15
Submitted / in revision articles	8
TOTAL	**46**

COST cited or funded	Number	%
COST cited in acknowledgments	35	76,09
COST STSM funding cited	18	39,13
COST ITC conference grants funding cited	2	4,35
COST funds (LOS, dissemination meeting, open access)	5	10,87

2. NANOFLUID PROJECTS

- During 1st half of project, 9 joint research proposals (4 to H2020) have been submitted

Journal of Colloid and Interface Science 547 (2019) 393–406

Contents lists available at ScienceDirect

Journal of Colloid and Interface Science

journal homepage: www.elsevier.com/locate/jcis

Regular Article

The contact angle of nanofluids as thermophysical property

M. Hernaiz [a], V. Alonso [a], P. Estellé [b], Z. Wu [c], B. Sundén [c], L. Doretti [d], S. Mancin [e], N. Çobanoğlu [f], Z.H. Karadeniz [g], N. Garmendia [h], M. Lasheras-Zubiate [h], L. Hernández López [i], R. Mondragón [i], R. Martínez-Cuenca [i], S. Barison [j], A. Kujawska [k], A. Turgut [l], A. Amigo [m], G. Huminic [n], A. Huminic [n], M.-R. Kalus [o], K.-G. Schroth [p], M.H. Buschmann [p,*]

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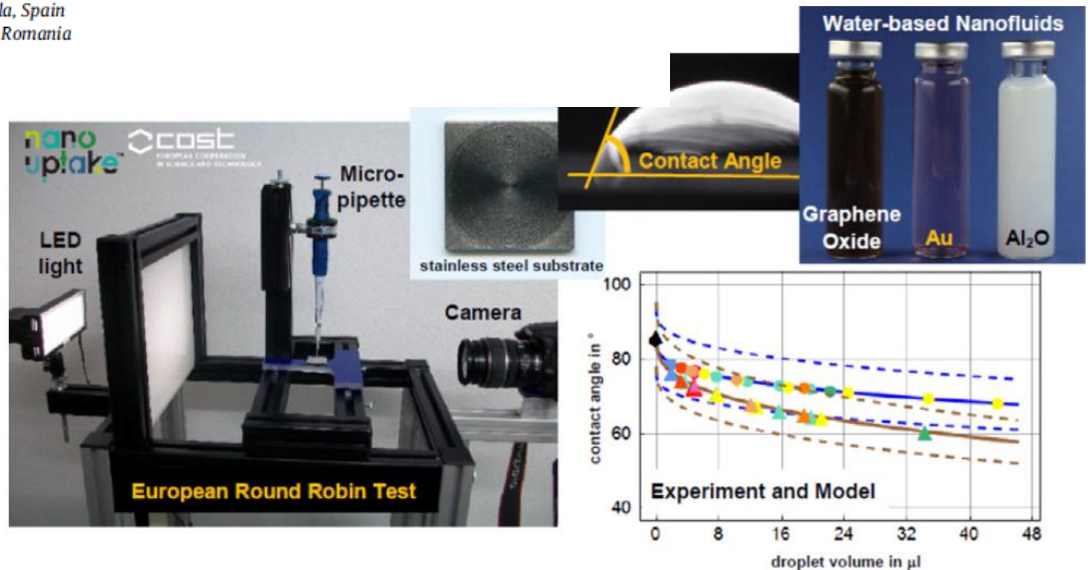
[o] Particular GmbH, Lise-Meitner-Straße 9, 31303 Burgdorf, Germany
[p] Institut für Luft- und Kältetechnik gGmbH Dresden, 01309 Dresden, Germany

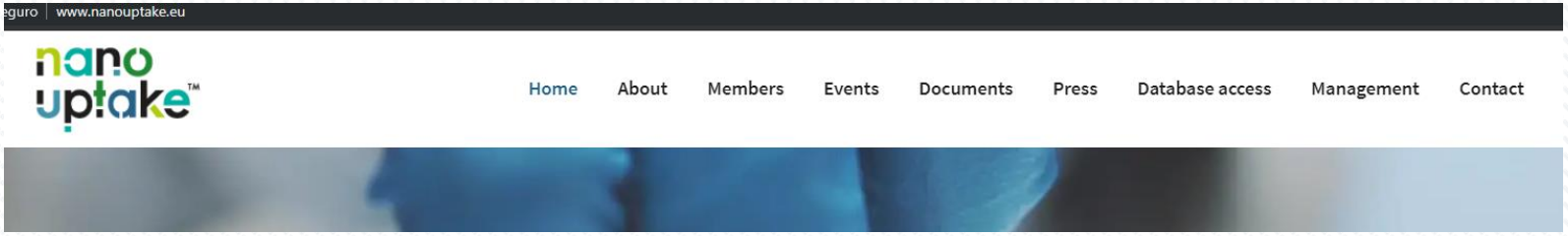
Round robin test among 11 Nanouptake institutions



SOME GENERIC RESULTS FOR THE 1st HALF OF THE ACTION

DISSEMINATION

PROJECT WEBSITE: http://www.nanouptake.eu/



RESEARCHGATE https://www.researchgate.net/project/Nanouptake-COST-action

Thermal and hydrodynamic performance of a microchannel heat sink with carbon nanotub…

Article Apr 2019

Normah Mohd-Ghazali · Patrice Estellé · Salma Halelfadl · […] · Ummikalsom Abidin

View

Comparative study of different functionalized graphene-nanoplatelet aqueous nanoflui…

Article Apr 2019

Javier P. Vallejo · Luca Mercatelli · Maria Raffaella Martina · […] · Elisa Sani

View

Colloidal stability of molten salt –based nanofluids: Dynamic Light Scattering tests at high…

Article Apr 2019

Nuria Navarrete · Alexandra Gimeno · Josep Forner Escrig · […] · Rosa Mondragón

View

Numerical Investigation of MHD Effects on Nanofluid Heat Transfer in a Baffled U-Shaped…

Article Jun 2018

Yuan Ma · Rasul Mohebbi · M.M. Rashidi · […] · Zhigang Yang

An experimental investigation of heat of vaporization of nanofluids

Article Apr 2019

Z. Baniamerian · R. Mehdipour · S M Sohel Murshed

The contact angle of nanofluids as thermophysical property

Article Apr 2019

M. Hernaiz · V. Alonso · Patrice Estellé · […] · Matthias H. Buschmann

SOME GENERIC RESULTS FOR THE 1st HALF OF THE ACTION

DISSEMINATION

SOCIAL NETWORKS:

https://www.facebook.com/nanouptake/

https://twitter.com/nanouptake

NEWSLETTERS

Strategic Meeting in Birmingham

Research staff of the European COST action Nanouptake and specialised industries meet to promote the use of nanofluids in the University of Birmingham last February.

Read more...

COST Connect, Sustainable Energy in the Danube Region

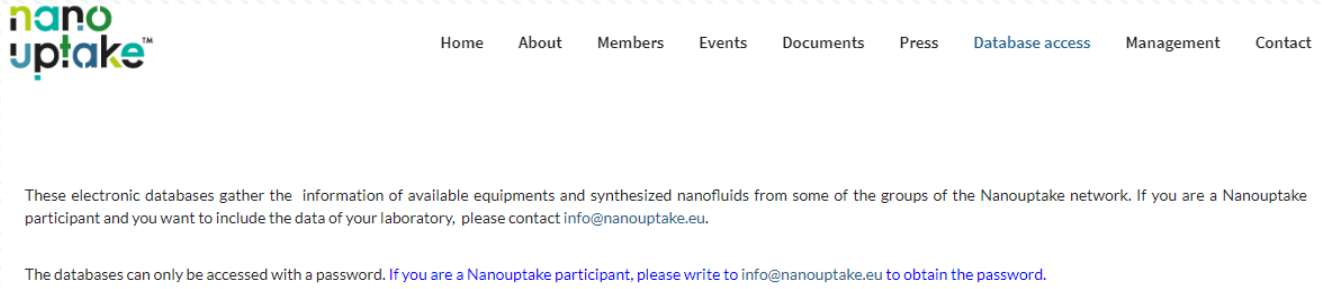
COST Connect, Sustainable Energy in the Danube Region was held in Belgrade, Serbia on October. Representatives from 15 COST Actions who are working within the Danube region met with key stakeholders and policy makers to encourage greater collaboration and alignment of resources.

Read more...

SOME SPECIFIC RESULTS FOR THE 1st HALF OF THE ACTION

DATABASES

Creating an electronic database of available experimental equipments and synthesized nanofluids among the members in the website



EQUIPMENTS

Clear filters | Columns | Print | Excel | CSV | Copy | PDF

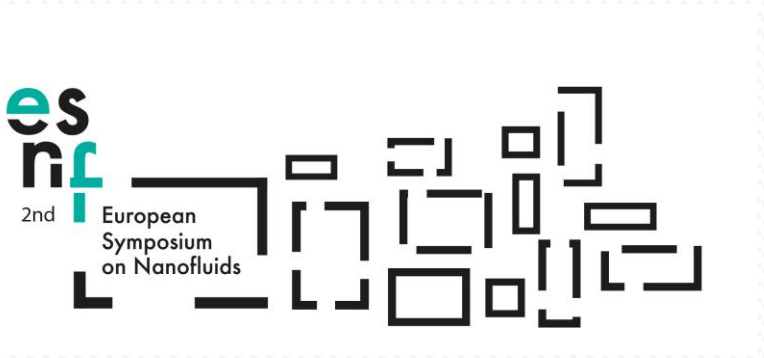
Show 25 entries Search:

MEASURABLE PROPERTIES	LOCATION/ INSTITUTION	TECHNIQUE
Absorption, transmittance and scattering spectra	Universitat Jaume I	UV-Vis
Chemical composition	Universitat Jaume I	Fourier-transform infrared spectroscopy
Crystal structure and chemical composition	Universitat Jaume I	X-Ray Difraction
Heat transfer coefficient (h), Nusselt number and pressure loss	Universitat Jaume I	Thermal hydraulic loop for nanofluids dynamic characterización
Morphology/Composition	Universitat Jaume I	Scanning electron microscopy-SEM
Morphology/Composition	Universitat Jaume I	Transmission electron microscopy-TEM

SOME FUTURE ACTIVITIES

www.icnf2019.com

26-28th June 2019, Castelló



- **Nanofluid materials** (nanoparticles, nanoPCM, nanofluids, nanosalts, ionanofluids, etc.)
- **Nanofluid preparation and characterization methods**, (stability, physical and chemical effects), agglomeration, etc.)
- **Nanofluid properties** (thermophysical, optical, and magnetic properties)
- **Heating, cooling, and refrigeration**
- **Phase change based heat transfer** (boiling, surface coating, heat pipes, etc.)
- **Storage of thermal energy**
- **Solar energy applications** (specific black nanofluids, volumetric solar collectors, etc.)
- **Numerical simulation** on the microscopic and macroscopic levels
- **Industrial applications**
- **Health, safety, and environmental issues**

1st International Conference on Nanofluids

2nd European Symposium on Nanofluids

When

26th-28th June 2019

Where

Universitat Jaume I
Castelló, Spain

Further information

www.icnf2019.com
secretary@icnf2019.com

Presentation

International Conference on Nanofluids (ICNf) and **European Symposium on Nanofluids (ESNf)** are a series of conferences under the auspices of the European Cooperation in Science and Technology (COST) Action - **NANOUPTAKE** (CA15119, www.nanouptake.eu).
Both events promote global **collaboration** and **exchange** between **researchers and engineers** working on **nanofluids** – suspensions with particles ranging in size from 10 nm to 100 nm – and related areas.
Focuses of ICNf 2019 include **production** and **characterisation of nanofluids** and **liquid-based nanocomposites**, **nanofluid-based heat transfer** and **storage of thermal energy** as well as **industrial applications**.
Representatives of related industries are invited to ICNf 2019 to enable direct **knowledge transfer from science to industry**.

Topics

ICNf 2019 covers a wide field of nanofluids **from basic research to real world industrial applications**:

- **Health**, **safety**, and **environmental** issues
- **Nanofluid materials** (nanoparticles, nanoPCM, nanofluids, nanosalts, ionanofluids, etc.)
- **Nanofluid preparation** and **characterisation methods** (stability, agglomeration, etc.)
- **Nanofluid properties** (thermophysical, optical, and magnetic properties)
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- **Numerical simulation** on the microscopic and macroscopic levels
- **Industrial applications**

1 **Keynote and invited speakers**
International first level speakers

Robert Taylor. University of New South Wales. Australia

Somchai Wongwises. King Mongkut's University of Technology Thonburi. Thailand

Yimin Xuan. Nanjing University of Science and Technology. China

Mohsen Sharifpur. University of Pretoria (UP). South Africa

Stephan Kabelac. Leibniz University Hannover. Germany

2 **Oral and poster contributions**
Open to all participants

3 **Sponsor the conference**
Contact us for exhibitor or sponsor opportunities

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COST is supported by the EU Framework Programme Horizon 2020

Collaborators:

nano uptake™

UJI UNIVERSITAT JAUME I

CONCLUSIONS

- COST Actions are an interesting tool for research networking
- You can both submit a COST Action proposal or join an ongoing proposal from your field
- The expected generic results of a COST Action are joint publications, joint project proposals and dissemination, and the specific results are negociated some at the beginning of the project and some yearly
- The experience of Nanouptake is very positive:
    - Good funding opportunity to perform funded Training Schools, conferences, exchange researchers visits, workshops, conferences, etc
    - Great opportunity to create partnerships for further joint projects
    - Large number of joint publications and proposals

nano uptake™

THANK YOU!

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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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