



15 PhD positions in the EU Horizon 2020 Marie Skłodowska-Curie Project: MSCA-ETN-COSMIC (European Training Network for Continuous Sonication and Microwave Reactors Project 721290)

Applications are invited for 15 PhD positions (“Early Stage Researchers”) to be funded by the Marie-Sklodowska-Curie Innovative Training Network “COSMIC – European Training Network for Continuous Sonication and Microwave Reactors” within the Horizon 2020 Programme of the European Commission. COSMIC is a consortium of high profile universities, research institutions and companies located in Belgium, Spain, Germany, UK, Italy, Austria and France.

Number of positions available:

15 PhD positions

Research Fields

Chemistry – Chemical Engineering - Materials Engineering - Physics - Life Cycle Engineering

Keywords

Process Intensification, Ultrasound, Microwaves, Microreactor, Millifluidics, Flow chemistry, Organic chemistry, Organic synthesis, Nanoparticles, LCA, Modelling

Career Stage

Early Stage Researcher (ESR) or 0-4 yrs (Post Graduate)

Benefits and salary

The successful candidates will receive an attractive salary in accordance with the MSCA regulations for early stage researchers. The exact salary will be confirmed upon appointment and is dependent on the country correction factor (to allow for the difference in cost of living in different EU Member States). The salary includes a living allowance, a mobility allowance and a family allowance (if married). The guaranteed PhD funding is for 36 months (i.e. EC funding, additional funding is possible, depending on local Supervisor). In addition to their individual scientific projects, all fellows will benefit from further continuing education, which includes internships and secondments, a variety of training modules as well as transferable skills courses and active participation in workshops and conferences.

On-line Recruitment Procedure (see Appendix 1 for full description)

All applications proceed through the on-line recruitment portal on the COSMIC website (<http://www.cosmic-etn.eu/>). Candidates apply electronically for one to maximum three positions and indicate their order of preference. Candidates provide all requested information including a detailed CV. During the registration, applicants will need to prove that they are eligible, according to the ESR definition, mobility criteria, and English language proficiency. The deadline for the on-line registration is **September 15th 2016**. The COSMIC Recruitment Committee selects between 20 and maximum 30 candidates for the Recruitment Event which will take place in Leuven (**October 10th 2016**). The selected candidates provide a 15 minute presentation and are examined by the Recruitment Committee. In order to facilitate their travel, selected candidates (from outside Belgium) receive a fixed, lump sum of 250 euro (paid by the prioritised Supervisor). Candidates having to travel far (outside Europe), can be interviewed via video-conferencing. The final decision on who to recruit is made the week after the Recruitment Event. The selected ESRs are to start their research as quickly as possible (**target: November 2016 - March 2017**).

Applicants need to fully respect three eligibility criteria:

Early-stage researchers (ESR) are those who are, at the time of recruitment by the host, in the first four years (full-time equivalent) of their research careers. This is measured from the date when they obtained the degree which formally entitles them to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the research training is provided, irrespective of whether or not a doctorate was envisaged.

Conditions of international mobility of researchers: Researchers are required to undertake trans-national mobility (i.e. move from one country to another) when taking up the appointment. At the time of selection by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation for more than 12 months in the 3 years immediately prior to their recruitment. Short stays, such as holidays, are not taken into account.

English language: Network fellows (ESRs) must demonstrate that their ability to understand and express themselves in both written and spoken English is sufficiently high for them to derive the full benefit from the network training. See for instance:

<http://www.helsinki.fi/facultyofscience/postgraduate/postapplicant.html>).

The 15 available positions**ESR 1: Ultrasound- and/or microwave-assisted C–H bond activation**

Objectives: To revolutionize current C–H activation methodologies by implementing ultrasound and microwave irradiation, both in batch and continuous-flow systems. To apply the developed techniques for the generation of high-value fine chemicals in drug design.

Host: KU Leuven (Belgium)

Lead Supervisor: Prof. Wim De Borggraeve (KU Leuven, wim.deborggraeve@kuleuven.be)

Duration: 36 months

ESR 2: Ultrasound- and/or microwave-assisted C=C bond activation

Objectives: To revolutionize the oxidative cleavage of unsaturated fatty acids and further hydrogenation of obtained products. To increase the mass transfer in the oxidative cleavage. To increase the hydrogenation catalyst's efficiency and lifetime by delaying the deactivation and by facilitating the catalyst reactivation at temperatures near the reaction temperature.

Host: Arkema (France) – Centre de recherché Rhône Alpes, Pierre-Bénite (near Lyon) – www.arkema.com

Lead Supervisor: Jean-Luc Dubois (Arkema, jean-luc.dubois@arkema.com), Prof. Giancarlo Cravotto (University of Turin, giancarlo.cravotto@unito.it)

Duration: 36 months

ESR 3: Ultrasound- and/or microwave-assisted C≡C bond activation

Objectives: To intensify alkyne cyclisation reactions catalysed by metal nanoparticles employing ultrasound and/or microwaves, both in batch and continuous-flow systems. To apply the developed techniques for the generation of high-value fine chemicals in drug design.

Host: KU Leuven (Belgium)

Lead Supervisor: Prof. Erik Van der Eycken (KU Leuven, erik.vandereycken@kuleuven.be)

Duration: 36 months

ESR 4: Radical formation by ultrasound

Objectives: To investigate the relation between physical and chemical effects in small, sonicated flow channels. To assess sonochemical activity in test reactions and correlate it with key parameters and cavitation conditions through synchronous measurements.

Host: University of Göttingen (Germany)

Lead Supervisor: Dr. Robert Mettin (University of Göttingen, robert.mettin@phys.uni-goettingen.de)

Duration: 36 months

ESR 5: Microwave-assisted synthesis of nanocatalysts in batch conditions

Objectives: To synthesise new nanomaterials based on metal nanoparticles under microwave irradiation. To investigate catalytic activities of proposed nanomaterials in various processes.

Host: University of Cordoba (Spain)

Lead Supervisor: Prof. Rafael Luque (University of Cordoba, q62alsor@uco.es)

Duration: 36 months

ESR 6: Microwave-assisted synthesis of nanocatalysts in flow conditions

Objectives: To control the transfer of microwave energy in slug-flow microreactors. To synthesize and optimize metal-containing nanoparticles (Pd, Pt) under flow and microwave conditions with the aim of catalyst development.

Host: University of Zaragoza (Spain)

Lead Supervisor: Prof. Jesús Santamaría (University of Zaragoza, jesus.santamaria@unizar.es)

Duration: 36 months

ESR 7: Ultrasound- and microwave-assisted synthesis of zeolite catalysts

Objectives: To enhance the reactive crystallization of submicronic zeolite crystals in continuous processes. To assess the effect of ultrasound- and/or microwave-assisted zeolite synthesis in terms of reaction kinetics, particle size distribution, crystallinity and aggregation of the synthesized solids. To develop design-extrapolation rules for ultrasound and/or microwave continuous reactors.

Host: Arkema (France) – Centre de recherché Rhône Alpes, Pierre-Bénite (near Lyon) – www.arkema.com

Lead Supervisor: Cécile Lutz (Arkema, cecile.lutz@arkema.com), Prof. Tom Van Gerven (KU Leuven, tom.vangerven@kuleuven.be)

Duration: 36 months

ESR 8: Microwave-assisted nanoparticle synthesis for health applications

Objectives: To design and develop a continuous flow microwave reactor for controllable intensified heating. To optimise operating conditions to achieve nanoparticle synthesis with controllable size and size distribution for applications in healthcare (e.g. diagnostics, antimicrobial, therapeutics).

Host: University College London, (UK)

Lead Supervisor: Prof. Asterios Gavriilidis (University College London, a.gavriilidis@ucl.ac.uk)

Duration: 36 months

ESR 9: Ultrasound-assisted nanoparticle synthesis for health applications

Objectives: To improve cooling, anti-solvent and reactive crystallisations by ultrasound in milliflow systems. To understand the effect of ultrasound and flow on crystallisation processes and products.

Host: KU Leuven (Belgium)

Lead Supervisor: Prof. Tom Van Gerven (KU Leuven, tom.vangerven@kuleuven.be)

Duration: 36 months

ESR 10: Ultrasound transfer in confined geometries of flow reactors

Objectives: To generate and characterize ultrasonic cavitation in small channels. To study the properties of hybrid hydrodynamic/acoustic systems. To apply numerical models to describe ultrasound propagation and predict cavitation regions in the confined geometries.

Host: University of Göttingen (Germany)

Lead Supervisor: Dr. Robert Mettin (University of Göttingen, robert.mettin@phys.uni-goettingen.de)

Duration: 36 months

ESR 11: Microwave transfer in confined geometries of flow reactors

Objectives: To develop an adaptable microwave-assisted continuous flow milli-reactor for organic (high-added-value products) syntheses. To enable the optimal operating conditions (i.e., heat-transfer rate, temperature level, microwave intensity, contact time).

Host: KU Leuven (Belgium)

Lead Supervisor: Prof. Georgios Stefanidis (KU Leuven, georgios.stefanidis@kuleuven.be)

Duration: 36 months

ESR 12: Clogging prevention in millifluidics

Objectives: To design milliflow devices and process conditions that are not prone to milli-channel clogging, and are able to yield solid material of specified size, purity, and morphology.

Host: KU Leuven (Belgium)

Lead Supervisor: Prof. Simon Kuhn (KU Leuven, simon.kuhn@kuleuven.be)

Duration: 36 months

ESR 13: Combining ultrasound and microwaves in chemical processes

Objectives: To optimize heat and mass transfer as well as catalytic effects for selected reactions by a combination of ultrasound and microwaves. To develop sequential and integrated configurations for the hybrid reactor. To carry out reactions in the hybrid reactor.

Host: University of Turin (Italy)

Lead Supervisor: Prof. Giancarlo Cravotto (University of Turin, giancarlo.cravotto@unito.it)

Duration: 36 months

ESR 14: Technical process strategy decision methodology

Objectives: To generate an easy-to-use toolbox for process-strategy decisions. To generate a realization approach.

Host: Microinnova (Austria)

Lead Supervisor: Dr. Dirk Kirschneck (Microinnova, dirk.kirschneck@microinnova.com), Prof. Tom Van Gerven (KU Leuven, tom.vangerven@kuleuven.be)

Duration: 36 months

ESR 15: Life-cycle assessment of emerging technologies

Objectives: To develop, apply and test a life-cycle assessment framework for emerging technologies, compared to traditional routes.

Host: University College London (UK)

Lead Supervisor: Prof. Paola Lettieri (University College London, p.lettieri@ucl.ac.uk)

Duration: 36 months

Public Abstract COSMIC: The European chemical industry faces some very serious challenges if it is to retain its competitive position in the global economy. The new industries setting up in Asia and the Near East are based on novel process-intensification concepts, leaving Europe desperately searching for a competitive edge. The transition from batch to continuous micro- and milliflow processing is essential to ensure a future for the European fine-chemicals and pharmaceuticals industries. However, despite the huge interest shown by both academia and industrial R&D, many challenges remain, such as the problems of reaction activation, channel clogging due to solids formation and the scaling up of these technologies to match the required throughput. COSMIC, the European Training Network for Continuous Sonication and Microwave Reactors, takes on these challenges by developing material- and energy-efficient continuous chemical processes for the synthesis of organic molecules and nanoparticles. The intersectoral and interdisciplinary COSMIC training network consists of leading universities and industry participants and trains 15 ESRs in the areas of flow technology, millifluidics and external energy fields (ultrasound and microwaves). These energy fields can be applied in structured, continuous milli-reactors for producing high-value-added chemicals with excellent yield efficiencies – in terms of throughput, waste minimization and product quality – that simply cannot be achieved with traditional batch-type chemical reactors. The chemical processes that are at the heart of COSMIC's game-changing research are catalytic reactions and solids-forming reactions. COSMIC's success, which is based on integrating chemistry, physics and process technology, will re-establish European leadership in this crucial field and provide it with highly trained young experts ready for dynamic careers in the European chemical industry.

Beneficiaries: *KU Leuven, University of Cordoba, University of Göttingen, University of Zaragoza, UCL, University of Turin, Microinnova, Arkema France*

Partner Organisations: *Smart Material GmbH, Weber Ultrasonics, Universitat Politècnica de València*

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Appendix 1: Recruitment Procedure COSMIC - Full description

Initially, the search for the appropriate candidates is based on normal recruitment strategies (i.e., publication on ec.europa.eu/euraxess, Nature and Science ads, etc.; personal contacts). The pre and final selection is made in a collective, fully transparent process, led by the Recruitment Committee (RC). The candidates apply for a maximum of three specific ESR projects and list their order of preference. Applications are made through an on-line, eligibility-proof form on the COSMIC website (<http://www.cosmic-etn.eu/>). The supervisors provide the names of their preferred candidates to the RC, which in its turn produces a short list of candidates. As such a maximum of 30 potential ESRs are invited to the Recruitment Event, which coincides with the pre-kick-off meeting (Leuven, M1, October 10th 2016). Each candidate gives a presentation and is interviewed by the RC. The candidates are ranked and a collective decision is made. In this way a complementary team of ESRs can be assembled. In order to facilitate their travel, preselected candidates (from outside Belgium) will receive a fixed, lump sum of 250 euro to be paid by the prioritised Supervisor.

In the event that not all 15 ESRs can be recruited during the collective Recruitment Event, the recruitment procedure is “decentralised”, meaning that the involved supervisors continue the search for good candidates. Recruitment problems are also, if still needed, discussed during the RC meeting (M6, M12) in order to deliver specific action plans to target particular networks relevant for the missing ESR positions. All details concerning the recruitment procedure principles are communicated on the on-line application portal, so that potential ESRs know exactly what to expect and are stimulated to apply. All recruitment is in line with the European Charter for Researchers, providing the overarching framework for the roles, responsibilities of both researchers and employers. The Code of Conduct for the Recruitment of Researchers functions as a set of principles and ensures that the selection procedures are transparent and fair. The recruitment strategy for COSMIC fully complies with the Code of Conduct’s definition of merit. For example, merit is not just measured by the researcher’s grades, but on a range of evaluation criteria, such as team work, interdisciplinary knowledge, soft skills and awareness of the policy impact of science. The RC has members of each gender and considers the promotion of equal opportunities and gender balance as part of the recruitment strategy. Special efforts are made to attract women and fellows from new EU Member States. COSMIC aims at a participation of 50% women in the network. Among equally qualified applicants, women receive preferential consideration. Researchers are employed on fixed-term contracts and are registered as candidates for PhD degrees. Therefore, the governing rules at the involved universities and companies concerning pension contributions, paid holidays, and other employment benefits are followed.

Recruitment committee: The RC involves the General Coordinator (T. Van Gerven) and one representative per Beneficiary (S. Kuhn, C. Lutz, R. Mettin, R. Luque, R. Mallada, A. Gavriilidis, G. Cravotto, D. Kirschneck). Its goal is to oversee the recruitment of the 15 ESRs during the collective recruitment event. It also follows up the ESRs’ training progress (incl. career planning). During the Recruitment Event additional Supervisors may be present.

Key dates:

- 15-09-2016: Deadline for on-line application for ESR positions
- 30-09-2016: Circulation of communication list “preselected candidates”
- 10-10-2016: Recruitment Event (Leuven) for preselected candidates
- 17-10-2016: Circulation of Communication list “recruited¹ COSMIC ESRs” ()
- November 2016 - March 2017: Initiation of ESR research work at the latest

¹ Human Resources departments of the Beneficiaries get the chance to make a final check and attach conditions to the recruitment.

For on the website:

I hereby declare that:*

- In the case I'm preselected, I will be available to give a 15 minute presentation at the COSMIC Recruitment Event in Leuven (October 10th 2016). Subsequently I will be examined by the Recruitment Committee. In order to cover (part of) my travel and lodging costs I will be receiving a lump sum of € 250, which will be paid by the "Envisioned" Supervisor (cf. my number one ESR position as indicated above). This reimbursement will be performed no later than 1 month after the Recruitment Event.

I hereby declare that I've read and understood the details of the Recruitment Procedure:*

- Initially, the search for the appropriate candidates is based on normal recruitment strategies (i.e., publication on ec.europa.eu/euraxess, Nature and Science ads, etc.; personal contacts). The pre and final selection is made in a collective, fully transparent process, led by the RC. The candidates apply for a maximum of three specific ESR projects and list their order of preference. Applications are made through an on-line, eligibility-proof form on the COSMIC website (<http://www.cosmic-etn.eu/>). The supervisors provide the names of their preferred candidates to the RC, which in its turn produces a short list of candidates. As such a maximum of 30 potential ESRs are invited to the Recruitment Event, which coincides with the pre-kick-off meeting (Leuven, M1, October 10th 2016). Each candidate gives a presentation and is interviewed by the RC. The candidates are ranked and a collective decision is made. In order to facilitate their travel, preselected candidates (from outside Belgium) will receive a fixed, lump sum of 250 euro to be paid by the prioritised Supervisor. In the event that not all 15 ESRs can be recruited during the collective Recruitment Event, the recruitment procedure is "decentralised", meaning that the involved Supervisors continue the search for good candidates. Recruitment problems are also, if still needed, discussed during the RC meeting (M5, M12) in order to deliver specific action plans to target specific networks relevant for the missing ESR positions. All details concerning the Recruitment Procedure principles are communicated on the on-line application portal, so that potential ESRs know exactly what to expect and are stimulated to apply. All recruitment (pre and final selection) is in line with the European Charter for Researchers, providing the overarching framework for the roles, responsibilities of both researchers and employers. The Code of Conduct for the Recruitment of Researchers functions as a set of principles and ensures that the selection procedures are transparent and fair. The recruitment strategy of COSMIC fully complies with the Code of Conduct definition of merit. For example, merit is not just measured on researcher's grades, but on a range of evaluation criteria, such as team work, interdisciplinary knowledge, soft skills and awareness of the policy impact of science. The RC has members of each gender and considers the promotion of equal opportunities and gender balance as part of the recruitment strategy. In view of the RRI principles, special efforts are made to attract women and ESRs from new EU member states. Among equally qualified applicants, women receive preferential consideration. Researchers are employed on fixed-term contracts and are registered as staff candidates for PhD degrees. Therefore, they are entitled to pension contributions, paid holidays, and other employment benefits, as governed by the universities and industrial companies.