# Position Details

## CSIRO Early Research Career (CERC) Postdoctoral Fellowship– CSOF4

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| The following information is for applicants | |
| Advertised Job Title | CSIRO Postdoctoral Fellowship in Thermochemical Processes |
| Job Reference | 79946 |
| Tenure | Specified Term of 3 years  Full-time |
| Salary Range | AU$89,926 to AU$98,504 pa (pro-rata for part-time) + up to 15.4% superannuation |
| Location(s) | Newcastle, New South Wales |
| Relocation Assistance | Will be provided to the successful candidate if required |
| Applications are open to | Australian/New Zealand Citizens, Australian Permanent Residents and Australian temporary residents currently residing in Australia (visa sponsorship may be provided to eligible onshore candidates) |
| Position reports to the | Team Leader, Solar Applications |
| Client Focus – Internal | 80% |
| Client Focus – External | 20% |
| Number of Direct Reports | 0 |
| Enquire about this job | Contact Dr Gregory Wilson via email at [Gregory.Wilson@csiro.au](mailto:Gregory.Wilson@csiro.au) or phone +61 2 4960 6017 |
| How to apply | Apply online at <https://jobs.csiro.au/>  Internal applicants please apply via **Jobs Central**  If you experience difficulties when applying, please email [careers.online@csiro.au](mailto:careers.online@csiro.au) or call 1300 984 220. |

**Acknowledgement of Country**

CSIRO acknowledges the Traditional Owners of the land, sea and waters, of the area that we live and work on across Australia. We acknowledge their continuing connection to their culture and pay our respects to their Elders past and present. View our [vision towards reconciliation](https://www.csiro.au/en/about/Indigenous-engagement/Reconciliation-Action-Plan).

### Role Overview

**CSIRO Early Research Career (CERC) Fellowships** provide opportunities to scientists and engineers who have completed their doctorate and have less than three years relevant research experience. These Fellowships aim to develop the next generation of future leaders of the innovation system through:

* A differentiated career development program to deliver capability excellence and breadth across all facets of the national innovation system;
* Research training via strategic research and development projects with a clear focus that will deliver real impact through science and engineering excellence;
* An innovative culture supporting the development and demonstration of original thinking and expertise leading to peer-recognition; and
* Opportunities to develop skills and experience in collaborative research teams to effectively work within national and global multi/transdisciplinary and multi-stakeholder environments.

CERC Fellows **are appointed for three years full-time or equivalent.**

CSIRO Energy has established the National Solar Energy Centre (NSEC) in Newcastle to conduct world class research and development in solar processes, components and photovoltaics. Our Solar Energy Technologies Group now welcomes a self-motivated and innovative **Postdoctoral Fellow** from a chemical engineering, physical chemistry, or chemical science background wanting to join an exciting, interdisciplinary team in the priority area of thermochemical processes for hydrogen generation using novel catalytic techniques.

***Science Background – microwave-enhanced thermochemical processes***

Hydrogen is a raw commodity of the future. The challenge is how to generate vast-volumes using renewable energy for a sustainable ecosystem. Enhancing the chemical decomposition of water is the thermodynamically most efficient pathway.

Hydrogen is a clean, green energy source for the future. Current global hydrogen demand is 70 million-tonnes & estimated to double to >>100 million tonnes by 2050 & almost entirely produced from natural gas and coal. Currently 6% of global natural gas + 2% of global coal go to hydrogen production equating to 830 million tonnes of CO2 emissions per year.

Thermochemical Hydrogen production is a pathway for chemical energy storage that enables both the use of waste heat from industrial processes (e.g. steel manufacture) or direct heating via renewable energy (e.g. concentrated solar thermal, CST) and a catalyst cycle based on Cerium oxide.

The reaction – literally water cleavage to break the O-H bond – is enhanced in the presence of a metal-oxide catalyst as this reduces the activation energy, through the chemical interaction of hydrogen bonding to surface oxygen in the catalyst.

In place of 'more thermal energy', microwave irradiation induces bond oscillation in chemicals + materials with a dipole, such as water (H-O-H) and catalysts (M-O) and can be delivered in targeted – directly absorbed – pulses. A fluidised bed reactor enables exchange of catalyst particles and reactants, yet also allows exchange from the bulk-to-the-surface where a surface enhanced reaction such as microwave-enhanced molecular interactions can be optimal in delivering energy effectively.

This project will develop an innovative reactor design that integrates a magnetron into a fluidised bed reactor, study the reaction kinetics of the thermochemical hydrogen reaction using analytical techniques to tune and enhance overall yield, optimise thermal input and microwave reactor conditions.

### Duties and Key Result Areas:

* Plan and carry out research that contributes and expands on existing thermochemical hydrogen research within the Solar Technologies Group
* Design, implement and conduct research in the study of reaction kinetics, catalysis and/or thermochemical processes for the production of hydrogen
* Research and develop new reactor designs, thermal processes and characterisation methods for the fundamental understanding of hydrogen generation or water splitting as it applies to microwave-enhanced processes incorporated in pressure reaction vessels
* Plan and develop safe work instructions and activity risk assessment of plant and equipment, seek approval and gain support for operation of reactors and processes involving hydrogen
* Undertake regular reviews of relevant literature and patents
* Produce high quality scientific and/or engineering papers suitable for publication in quality journals, for client reports and granting of patents
* Prepare appropriate conference papers and present those at conferences as agreed with your supervisor
* Effectively manage intellectual property and access to commercially sensitive information
* Supervise and mentor emerging researchers at postgraduate level in technical areas related to the main project area of expertise
* Make a contribution to the effective functioning of the research team and help deliver CSIRO’s organisational objectives and plans

Under the direction of senior research scientists and engineers, CERC Fellows:

* + Carry out innovative, impactful research of strategic importance to CSIRO that will, where possible, lead to novel and important scientific outcomes.
  + Recognise and exploit opportunities for innovation and the generation of new theoretical perspectives, and progress opportunities for the further development or creation of new lines of research
  + Utilise design thinking methodology to plan and prepare research proposals, and apply non-academic impact methodology to research projects
  + Carry out research investigations requiring originality, creativity and innovation
  + Record, manage, and analyse data/information using relevant domain data science techniques.
  + Proactively undertake development to grow effective researcher capabilities to support career goals.
  + Adhere to the spirit and practice of CSIRO’s Code of Conduct, Health, Safety and Environment procedures and policy, Diversity initiatives and Making Safety Personal goals.
* Other duties as directed by the Research Group Leader.

The CERC Fellow learning, development and training programis developed between the CERC Fellow and their CSIRO supervisor. The program will focus on enhancing the Fellow’s capabilities to the level expected of an independent researcher and will include on-the-job and course-based development encompassing:

* Discipline-specific techniques and protocols
* Professional growth
* Project management
* Communication and influencing skills
* Working and collaborating with others

## **Required Competencies:**

* **Teamwork and Collaboration:** Cooperates with others to achieve organisational objectives and may share team resources in order to do this. Collaborates with other teams as well as industry colleagues.
* **Influence and Communication:** Uses knowledge of other party's priorities and adapts presentations or discussions to appeal to the interests and level of the audience. Anticipates and prepares for others reactions.
* **Resource Management/Leadership:** Allocates activities, directs tasks and manages resources to meet objectives. Provides coaching and on the job training, recognises and supports staff achievements and fosters open communication in the team.
* **Judgement and Problem Solving:** Investigates underlying issues of complex and ill-defined problems and develops appropriate response by adapting/creating and testing alternative solutions.
* **Independence:** Recognise and makes immediate changes to improve performance (faster, better, lower cost, more efficiently, better quality, improved client satisfaction).
* **Adaptability:**Copes with ambiguity or situations that lack clarity. Adapts readily to changing circumstances and new responsibilities (which may include activities outside own preferences) in the interests of achieving team objectives. Recognises the need for and undertakes personal development as a result of changes.

## **Selection Criteria**

#### Essential

*Under CSIRO policy only those who meet all essential criteria can be appointed.*

1. A doctorate (or will shortly satisfy the requirements of a PhD). The doctorate must be in a relevant discipline area, such as Chemical Engineering, Physical Chemistry, Applied Analytical Chemistry, Industrial Chemistry or Chemical Sciences.

Please note: To be eligible for this role you must have **no more than 3 years** (full-time equivalent) of relevant research experience.

1. Detailed fundamental knowledge of reaction chemistry and kinetics, preferably in thermochemical processes and/or hydrogen from water spitting reactions.
2. A sound understanding of the fundamental issues and present challenges relating to catalytic production of hydrogen, a working knowledge of reaction kinetics and characterisation techniques for examining such processes.
3. Enthusiasm for and experience with laboratory work including design and assembly of pressure vessels, reactors operating under pressure and methodologies for studying *insitu* kinetics of reactions in thermochemical processes.
4. Relevant experience and strong track record in safe operation of fluidised bed reactors, gas systems, pressure vessels and equipment for monitoring pressure and/or temperature of reactions.
5. High level written and oral communication skills with the ability to represent the research team effectively internally and externally, including the presentation of research outcomes at national and international conferences.
6. A sound history of publication in peer reviewed journals and/or authorship of scientific papers, reports, grant applications or patents.
7. A record of science innovation and creativity, including the ability & willingness to incorporate novel ideas and approaches into scientific investigations.

## **Desirable:**

1. Demonstrated knowledge of gas chromatography, mass spectrometry and related analytical techniques for examining reaction kinetics and progress.
2. Experience in larger-scale laboratory systems, hydrothermal equipment and/or high-pressure reactor design and commissioning.
3. Remain productive, positive and resilient in complex, ambiguous and/or uncertain environments.
4. **The ability to work effectively as part of a multi-disciplinary, potentially regionally dispersed research team, plus the motivation and discipline to carry out autonomous research.**

To be appointed to this CERC Fellowship role within CSIRO, candidates will be expected to commence employment by 30 June 2022. To be appointed as a CERC Fellow within CSIRO, candidates are required to have **submitted** their doctoral thesis at the time of commencement, as a minimum requirement, if PhD conferment has not been obtained. If a candidate has submitted, but their PhD has not yet been formally attained, the starting salary will be CSOF4-1 ($87,068). Upon CSIRO receiving written confirmation that the PhD has been awarded (within a six month period from commencement date), the salary will be increased to the negotiated level and the difference will be back-paid to the Officer’s start date.

Special Requirements

Appointment to this role may be subject to conditions including provision of a national police check as well as other security/medical/character clearance requirements.

* The successful candidate will be asked to obtain and provide evidence of a National Police Check or equivalent. Please note that people with criminal records are not automatically deemed ineligible. Each application will be considered on its merits.
* The successful candidate may be required to undertake a pre-employment medical examination prior to commencement.
* If the successful candidate is not an Australian Citizen or Permanent Resident, they may be required to undergo additional security clearances, which may include medical examinations and an international standardised test of English language proficiency (i.e. IELTS test).- https://ielts.com.au/

**Our value proposition**

We want CERC Fellows to join our world class science, engineering and digital teams to solve big, complex problems that make a real difference to the future of Australia and the world.

You'll get to work with some of the most talented minds in their fields, not just in Australia, but in the world. At CSIRO, we spark off each other, learn from each other, trust each other and collaborate closely to achieve more than we could individually.

Find out more about our CSIRO Early Research Career (CERC) Fellow Experience Employee Value Proposition (EVP) [here](https://www.csiro.au/en/careers/postdoctoral-fellowships).

## **About CSIRO:**

We solve the greatest challenges through innovative science and technology. To find out more visit us [online](http://www.csiro.au/)!

CSIRO is a values-based organisation.  In your application and at interview you will need to demonstrate behaviours aligned to our values of:

* 1. People First
  2. Further Together
  3. Making it Real
  4. Trusted

Find out more about CSIRO [Energy](https://www.csiro.au/en/Research/EF)