Conclusion

The work within SHC Task 62 shows solar energy’s great potential in wastewater treatment. Nevertheless, there is still the need to take further action.

Using separation technologies such as membrane distillation in combination with solar process heat represents an innovative leap in the industry. The technical and economic potential assessment for using solar-driven water treatment sets the course for further research and development projects in the most significant industrial sectors and municipal wastewater treatment, but also for use in rural areas (e.g., Africa) for applications like drinking water production. With an overview of the identified potentials and research and development needs, follow-up projects for the demonstration of solar supply and separation technologies for wastewater are required to increase awareness and experiences.

In addition to thermal technologies, decontamination, and disinfection processes are paramount in wastewater treatment. Developing new decontamination and disinfection systems using solar photons must gain significant attention and visibility as a promising solution for achieving effective and sustainable disinfection. Further, the simultaneous harnessing of heat and UV light in one technology (solar reactor) represents a leap forward in innovation compared to the state-of-the-art.

An important application area for solar reactors is the production of new energy vectors (e.g., hydrogen from wastewater, reducing carbon dioxide to methanol and other fuels). Sunlight-based photo reforming (e.g., photocatalysis) shows great potential to revolutionize the energy sector, providing a clean and sustainable energy source for various applications. However, many challenges remain to overcome, such as improving the efficiency and scalability of the energy conversion processes and reducing the costs associated with producing and distributing solar fuels.

The good news is that the SHC Programme is starting a new Task on energy sources from solar-powered reactors. To learn more, see the sidebar “New Task Under Development.”

Article contributed by Christoph Brunner (SHC Task 62 Manager) and Sarah Meitz of AEE INTEC, Austria.

New Task Under Development

Using Radiation to Produce Hydrogen and Other Fuels

The demand for “green” energy sources is on the rise! And as countries strive to decarbonize, hydrogen is emerging as an essential commodity. However, the challenge this presents lies in the fact that 99% of hydrogen production still relies on non-renewable sources. Similarly, other fuels like methane, methanol, and ethanol face this production predicament. Plus, even if these green fuels were exclusively used for industrial purposes, freight and air transportation, the surplus electricity generated from renewable sources such as wind and photovoltaics (PV) combined with electrolyzers could adequately fulfill the demand. Therefore, it is crucial to explore alternative methods - solar energy - to generate these “green gases.” And the IEA SHC Programme is stepping up.

A new project is under development on energy sources from solar-powered reactors.

This proposed Task plans to focus on technologies that use solar radiation to produce hydrogen and other fuels via thermo-catalytic, photothermal, photocatalytic, and photo-electrochemical processes. During this Task, materials researchers and solar experts will exchange knowledge and share new possibilities and developments on reactor designs, system integrations, and potential new product segments.

This Task is in the definition phase, so if you are interested in learning more or are from an IEA SHC member country or organization and would like to join the first Task Definition Meeting, please contact the Task Organizer, Dr. Bettina Muster-Slawitsch at b.muster@aee.at.