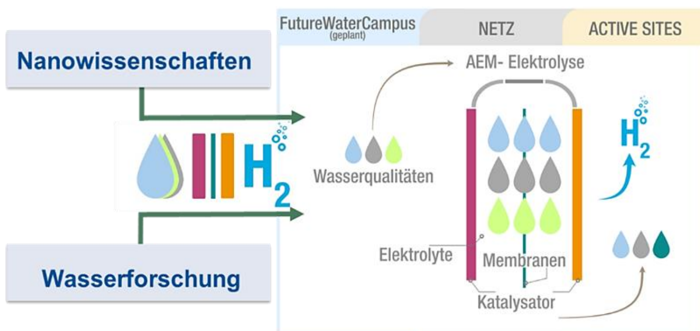
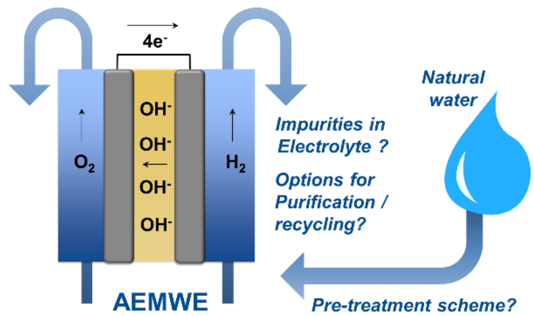
“Natural-Water-to-Hydrogen” project is an initiative of the University of Duisburg-Essen (UDE) with the aim of increasing the sustainability of green hydrogen production through water electrolysis. Today, ultra-pure water is used for water electrolysis, which is obtained by treating tap water. The planned massive expansion of electrolysis capacities to produce green hydrogen implies an increased demand for ultrapure water, which can only be met by sustainable water resources. In this project, the influence of various water components - including typical anions and cations, also natural organic matters - on the efficiency and long-term stability of the low-temperature anion exchange membrane (AEM) water electrolysis is investigated. AEM electrolysis is a fluorine-free technology that can be operated with naturally occurring electrocatalysts, not based on rare precious metals, and offer significant advantages over already established proton exchange membrane (PEM) electrolyzers in terms of cost and scalability.



The ultimate objective of the research project is investigating the natural water quality to enable an efficient and robust AEM electrolysis process at reasonable costs, while exploring a minimal pretreatment scheme for inlet water. Knowledge of the actual requirements for the optimum or minimum required water quality for AEM electrolysis enables the use of minimally treated water on the one hand and defines the water quality to be maintained during electrolysis on the other. This new approach of systematically linking water research with electrochemistry and membrane / material science will drive excellent, innovative and future-oriented research on H_2 electrolysis from renewable energies and contribute to the provision of sustainable energy resources for future generations.

While AEM electrolysis cell components (e.g., electrocatalyst, ionomer, membrane) are investigated in other work packages **WP1** - **WP5**, in work package **WP6** our chair is the production and assurance of a constant water quality in the technical electrolysis process. Our tasks include identifying impurities (e.g., corrosion products, byproducts of OER and HER reactions, degradation products) that may form in the electrolyte circuit during AEM electrolysis and establishing strategies to purify the recirculated water, aiming to achieve the suitable water quality required for stable AEM electrolysis. The assurance of an adequate feed water quality is carried out with conventional technologies, whereas the technical adjustment of the water quality in the internal water circuit requires innovative selective elimination technologies that can be operated in the electrolysis temperature range and in a dynamic operation with rest periods without releasing substances.



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NETZ NANOENERGIE TECHNIKZENTRUM

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