

# Evaluation and Design of Thermochemical and Hybrid Water-Splitting Cycles

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## **Abstract**

We developed a methodology for evaluating and screening water-splitting cycles. Screening is effective without need for advanced flowsheets. We first define the thermodynamic efficiency of each cycle using the minimum reversible energy (heating and work) requirement. We base this calculation on a new algorithm that uses excess reactants for reactions that are not spontaneous (high negative  $\Delta G$ ) as well as minimum utility calculations using the pinch method. We also include the separation work, when needed. We then assess the real efficiency of the cycle by estimating real minimum heating utility as well as separation energy. We finally optimize T, P and excess reactants for each cycle, and provide examples.