Researchers develop novel supercritical water oxidation system

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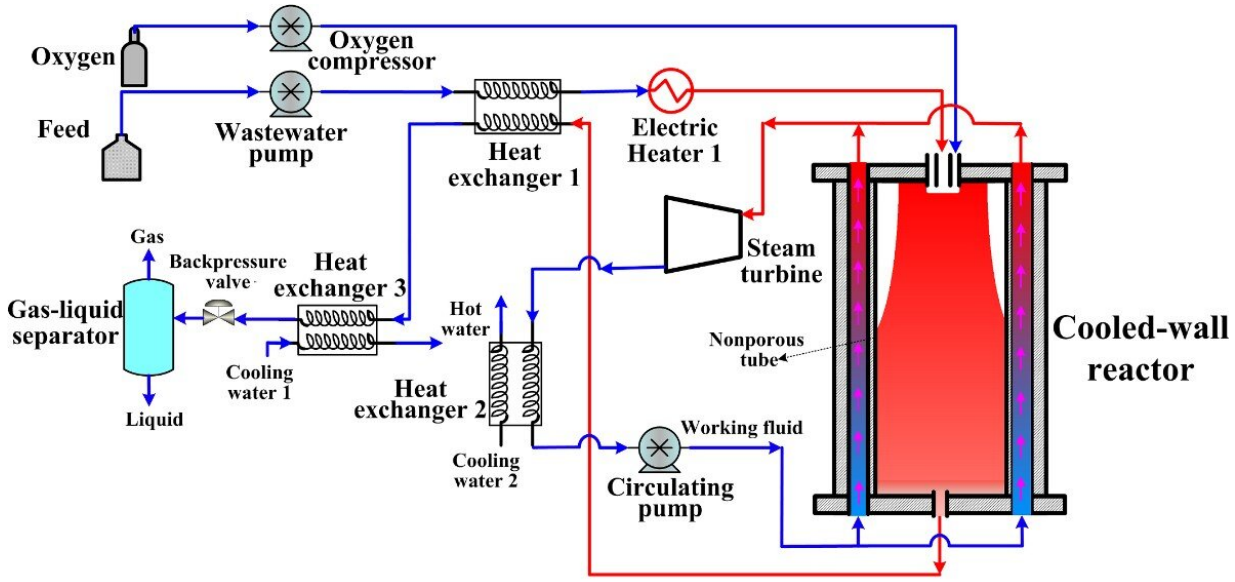

The novel supercritical water oxidation system with an inverse cool-wall reactor. Credit: ZHANG Fengming

A research group from the Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences has proposed a novel supercritical water oxidation (SCWO) system with an inverse cool-wall reactor to realize energy self-sufficiency. The study was published in *Applied Thermal Engineering*.

SCWO is a powerful green technology to treat hazardous wastewater. Its industrial application has three main problems: corrosion, salt plugging and high treatment cost.

Transpiring and cooled-wall reactors are widely used to overcome the corrosion and salt plugging problems in the SCWO process. However, the energy consumption will increase due to the decrease of energy grade of the reactor effluent.

According to the study, with the improved cool-wall reactor and corresponding system, the energy consumption could be greatly reduced since the energy recovered from the reactor effluent was upgraded for power generation.

Using Aspen Plus 8.2, the researchers simulated the SCWO system with an inverse cool-wall reactor, which in some ways parallels the countercurrent heat exchange.

They also conducted exergy analysis to compare the proposed system with the previous SCWO system with a transpiring wall reactor. They found that the treatment cost was reduced by nearly 30%.

"The increase of fluid temperature or feed concentration contributes to energy self-efficiency," said Dr. Zhang Fengming from SIAT. "High feed concentration may lead to high reaction temperature, but this issue can be easily solved by increasing heat transfer area."

More information: Fengming Zhang et al. Energy self-sufficiency of a supercritical water oxidation system with an improved cooled-wall reactor for power generation, *Applied Thermal Engineering* (2020). DOI: 10.1016/j.applthermaleng.2020.115158