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COUPLING OF NUCLEAR AND RENEWABLE ENERGY SOURCES FOR SUSTAINABLE HYDROGEN PRODUCTION

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The concerns regarding global climate change are significant and have resulted in extensive R&D on alternative, clean energy sources. While many of the available renewable energy resources are limited due to their reliability, quality, quantity and density, nuclear energy has the potential to contribute a significant share of energy supply without contributing to climate change. Hydrogen production via thermochemical water decomposition is a potential process for direct utilization of nuclear thermal energy to increase efficiency and thereby facilitate energy savings. Thermochemical water splitting with a copper-chlorine (Cu-Cl) cycle could be linked with nuclear and renewable energy sources to decompose water into its constituents, oxygen and hydrogen, through intermediate copper and chlorine compounds. In this study we analyze a coupling of nuclear and renewable energy sources for hydrogen production by the Cu-Cl thermochemical cycle. Nuclear and renewable energy sources are reviewed to determine the most appropriate option for the Cu-Cl cycle. A thermodynamic analysis and several parametric studies are presented for various configurations of this coupled system to ascertain its benefits.

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