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**EDITORIAL**

# Hydrogen Safety for Hydrogen Energy Applications and Large-scale Commercialization

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The increasing demand for energy in the world and the environmental pollution caused by conventional chemical fuels constantly promote the development and utilization of new energy. As a kind of new energy, hydrogen is favored by countries all over the world because of its diverse sources, convenient storage and transportation, efficient utilization, and environmental friendliness [1]. However, hydrogen is flammable and explosive, which has a wide range of combustion, and deteriorates the mechanical properties of materials. There are hidden dangers such as leakage and explosion in the preparation, storage, transportation, filling, and use of hydrogen, so hydrogen safety is particularly important in the application and large-scale commercial promotion of hydrogen energy. Therefore, it is an important guarantee for the development and safe application of hydrogen energy technology to transition to a more sustainable stage by making clear the danger of hydrogen and conducting basic research on the consequences and prevention of hydrogen safety accidents, to provide a reliable basis for the formulation of relevant standards and regulations. At present, there is little research in the field of hydrogen safety in relevant institutions around the world, and only some milestones have been achieved.

At present, the hydrogen safety research is still facing challenges, whose research status is mainly divided into three aspects, such as hydrogen leakage and diffusion [2], hydrogen combustion and explosion [3], and the compatibilitybetween hydrogen and metal materials [4]. There is still a need to make appropriate risk assessments for hydrogen safety, hydrogen safety research is still immature, and hydrogen safety issues still face challenges [5]. In the aspect of hydrogen leakage and diffusion, the influence of the shape of the leakage port, hydrogen concentration gradient, and air buoyancy on hydrogen leakage and diffusion still needs further study, and it is still difficult to establish a two-phase leakage model considering the non-ideal characteristics of liquid hydrogen. In terms of hydrogen combustion and explosion, the mechanism of flame acceleration and deflagration detonation transition is still unclear, and the mechanism and experimental study of hydrogen spontaneous combustion still need to be strengthened. As for the compatibility between hydrogen and metal materials, the test data of materials in a high-pressure hydrogen

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environment is relatively scarce, and the international unified test standard for compatibility between hydrogen and materials and the storage and transportation standard of hydrogen-doped natural gas has not been established, and the standards for hydrogen-blended natural gas storage and transmission are not clear. In terms of hydrogen risk assessment, more quantitative risk assessment methods for leakage accidents under typical hydrogen application conditions still need to be established, and there are relatively little effective data on structural failure and leakage frequency of hydrogen systems. Due to the complexity and diversity of the real situation of hydrogen safety problems, the above problems should be further discussed. As hydrogen safety is an important part of the research in the field of hydrogen energy, the research on hydrogen safety has become the most important issue in the near future.

## Conflict of Interest

There is no conflict of interest.

## References

[1] Wei, R., Lan, J., Lian, L., et al., 2022.A bibliometric study on research trends in hydrogen safety. Process Safety and Environmental Protection. 159, 1064-1081.

[2] Gao, Q., Wang, L., Peng, W., et al., 2022. Safety analysis of leakage in a nuclear hydrogen production system. International Journal of Hydrogen Energy. 47(7), 4916-4931.

[3] Yang, F., Wang, T., Deng, X., et al., 2021. Review on hydrogen safety issues: Incident statistics, hydrogen diffusion, and detonation process. International Journal of Hydrogen Energy. 46(61), 31467-31488.

[4] Ronevich, J.A., Song, E.J., Somerday, B.P., et al., 2021. Hydrogen-assisted fracture resistance of pipeline welds in gaseous hydrogen. International Journal of Hydrogen Energy. 46(10), 7601-7614.

[5] Caliendo, C., Russo, P., Ciambelli, P., 2021. Hydrogen safety, state of the art, perspectives, risk assessment, and engineering solutions. Sustainable Energy & Fuels. 3, 433.