

General Comments:

Energy perspective: fuel cell proton membrane

Energy is the power source for the development of human society, and every progress of human society is inseparable from breakthroughs and innovations in energy technology. However, the existing energy structure and the unreasonable use of human beings have brought heavy losses to human society, such as acid rain, greenhouse effect, global warming, air pollution, ozone layer destruction and other environmental problems. The search for efficient, clean and sustainable development of new energy technology is also a problem that all countries must face and pay attention to. Among them, in 2020, China has proposed the goal of reaching the carbon peak and carbon neutrality, and has aroused attention in the domestic and international community.

In this background, the research of Fuel Cell (FC), a new energy technology, is crucial. It is an electrochemical device that converts chemical energy directly into electrical energy, and is known as the fourth power generation method after thermal power, hydropower and nuclear power. Proton exchange membrane fuel cell (PEMFC) has the advantages of high energy density, low operating temperature and good stability, and has a wide application prospect in aerospace, submarine, electric vehicle and other fields.^[1] The core of this technology is electrochemical reaction through ion exchange membrane, the most typical of which is Nafion PFSA membrane, which has excellent performance in ion exchange capacity, proton conductivity, chemical stability and high temperature resistance and other performance indicators. And there are currently no fully suitable alternatives. More importantly, for the research of PEMFC technology, governments, universities and companies have paid huge investment (money, goods, people and time), and have also achieved some representative research results,^[2-3] if it is easily stopped, it will inevitably cause huge losses.

In summary, it is hereby hoped that these fluoropolymers and their related polymeric monomers and chemicals will be exempted from use in the European market until alternatives with fully satisfactory performance become available.

References

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[3] Zhang Q N, Dong S D, Feng X, et al. Covalent organic framework-based porous ionomers for high-performance fuel cells [J]. *Science*, 2022, 378, 181-186.