

Application Number: E.2.12 (Energy Field)

Application Name: Gas Insulation Equipment

· We are applying for exemptions for the following applications of PFAS used in the energy field.

Subject to use: Used for gas injection nozzles (hereinafter abbreviated as nozzles) in breaker units inside high-voltage gas circuit breakers.

Gas used: Insulating gas SF6

Use conditions: Ultra high temperature (about 20000°C)*3), high pressure

Essential conditions: No hydrogen is contained in material composition of nozzles. *2), *3)

Materials of nozzles have insulation properties. *1)

Materials of nozzles do not crack under high temperature and high pressure conditions. *3)

High viscosity in the molten state.

References

*1) U.D.C. 621.316.5.048.83.001.7 "Technical Trends in Gas Insulated Switchgear" (Kokubu Works, Hitachi, Ltd.)

*2) International Publication No. WO 2013/118348 A1 (Mitsubishi Electric Corporation)

*3) 15(247), Advanced Technology R&D Center, "Performance Improvement of SF6 Gas Shutoff Unit by Arc Cooling Technology Suitable for New Ablation Material" (Mitsubishi Electric

Corporation)

The materials often used for such a product are PTFE (CAS No.: 9002-84-0) alone and a nozzle in which alumina, a colorant, etc. are blended as fillers in PTFE alone. *4)

References

*4) IEEJ Trans. FM, Vol. 124, No. 8, 2004 "History of Hitachi's Independent Research and Development of Ultra-High Pressure Puffer Type Gas Circuit Breakers"

The material that satisfies the above specification conditions is PTFE (CAS No.: 9002-84-0), for which there is no alternative at this time. For example, ceramics could be considered as a new alternative material, but it is difficult to fulfill the role of a shutoff nozzle because it is prone to cracking due to localized rapid heating and cooling.

References

*5) Introduction to Ceramic Materials Engineering (University of Tsukuba, School of Applied Science and Engineering, 2016, Yoshikazu Suzuki)

If the PTFE-containing nozzle is unavailable, primary energy obtained from nuclear, thermal, hydroelectric, and geothermal power plants will no longer be available to maintain daily

life and social activities. This would be a major blow to the gross domestic product, which is supported by energy. For example, Japan's gross domestic product is 548 trillion yen, the EU's GDP is \$17.1654 trillion, and the United States' GDP is \$18.4226 trillion, and the economic development and growth of countries around the world are severely impacted. *6), *7), *8)

Therefore, it is essential that PTFE be used as the material for nozzles for high-voltage gas-insulated switchgear (GIS), and by the use of this material, power companies can maintain a stable supply of electricity to each industry.

We propose a permanent exemption for the above reasons.

References

*6) Japan, Cabinet Office, Economic and Social Research Institute, National Accounts (GDP Statistics) Actual Annual GDP for FY2022

*7) Japan, Ministry of Foreign Affairs, European Union (EU) (GDP Statistics) 2021

*8) Japan, Ministry of Foreign Affairs, United States of America (USA) (GDP Statistics) 2020