誘導熱プラズマを用いたSF6ガス消弧性能の検証

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Study of Arc Quenching Properties of SF_6 by Induction Thermal Plasma

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Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

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Kanazawa University

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SF6 / N_2 / Induction Plasma / Circuit Breaker / Electrode Vapor / Electron Affinity / Pinch / Thermal Conductivity

Research Abstract

The research is mainly devoted to develop a standard test device to investigate the arc quenching properties of SF6 gas and the influence of electrode and nozzle material vapors on it. A fundamental feature of the device is that the induction plasma is used as a main plasma source, which enable us to generate a clean and high temperature plasma medium in any kinds of gases at high pressure conditions like in circuit breakers. In the

final year of the program, 1997, special attention was paid on the important effects of electron attachment, that is, decrease of the electron unmber density as well as the decrease of electron energy. The N2 gas properties was also investigated as a future quenching medium family with the earth circumstance by this plasma technique. Main results obtained are as follows ;
1) Generation of High Pressure SF6 Induction Plasma Although until the previous year, the pressure of the plasma is limited to 200 torr soft vacuum condition, A high-pressure 760 torr induction SF6 plasma was firstly generated in stable mode, which give the more reliable conditions close to those occurring in circuit breakers. N2 induction plasma was also recognized to be generated at such high pressure.
2) Measurement of Plasma Temperature Spectroscopic measurement with atomic spectra from S,F,and Ar revealed that the induction plasmas are in high temperature of around 10,000 K.However, SF6 gas shows a remarkable properties of quenching of the plasma radius due to its high thermal conductivity and electron attachment effect compared to N2 gas.
3) Effect of Cu Vapor Contamination By using the plasma technique, the effects of 1-% Cu vapor contamination were studied quantitatively and this increases the electron density and thus the radius of the induction plama, which will result in a reduction of the current interruption performance.

Research Products (12 results)

All Other

All Publications (12 results)

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[Publications] K.C.Paul, T.Sakuta: "Transport and Thermodynamic Properties of SF6 Gas Confaminated by PTFE reignforced with Al_2O_3 and BN Particles" IEEE Trans.on Plasma Science. 25. 786-798 (1997)

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