

Theme: Environmental Technology for Sustainability

- Sub theme: Gas Abatement Technology using Plasma-Catalysis

Increasing anthropogenic emission of greenhouse gases (GHGs) has been a great concern. Among them, perfluorocarbons (PFCs), N_2O and NF_3 are mainly emitted from semiconductor industry for the cleanup of chemical vapor deposition (CVD) chambers and plasma etching. The GWP (global warming potential) and atmosphere lifetime of PFCs are known to be thousands of times higher than that of CO_2 . Greenhouse gases (GHGs) such as PFCs have huge effects on climate change accompanied by global warming even though only very small amounts are exhausted into the atmosphere. PFCs can be completely decomposed at extremely high temperature environment of over several thousand degrees Celsius due to its high chemical stability. Arc plasma offers a steep temperature gradient that enables high enthalpy to enhance the kinetics of the decomposition reactions and extreme flow velocity. The high temperature and the high reactivity of the plasma state can be utilized to provide a powerful medium to promote high heat transfer rates and chemical reactions for the abatement process. Though, arc plasma process requires a high electrical consumption in order to achieve a high destruction and removal efficiency (DRE). Catalytic hydrolysis can be a relatively simple and economical option for PFCs removal. However, catalysis process needs to be operated at a high temperature ($\leq 600^\circ C$) for high DRE and improve resistance from acid gases and catalytic poison. Plasma integrated with catalyst seems promising since synergistic effects can be induced to reduce energy consumption and to enhance the chemical activity of catalyst. We are highly interested in (but not limited to) the following list of topics:

1. Catalyst solution to improve resistance from catalytic poison
2. Optimization process for gas abatement using plasma-catalysis method
3. Synergetic effect for energy consumption with high DRE of CF_4 , N_2O , NF_3
4. Synergetic effect of plasma (non-thermal plasma or arc plasma) with catalyst

※ *The topics are not limited to the above examples and the participants are encouraged to propose the original idea.*

※ *Funding: Up to USD 150,000 per year*