Nitrous oxide (N\textsubscript{2}O), which is the main ingredients of anesthetic gas, has 310 times higher global warming potential than CO\textsubscript{2} and long life time in atmosphere\cite{1}. But almost all anesthetic gas has been released after medical operations without any treatments. In Japan, total emission late of N\textsubscript{2}O gas from operation room is 1,000 ton/year and it correspond to CO\textsubscript{2} gas of 310,000 ton/year. N\textsubscript{2}O is easily decomposed by heating and so the decomposition systems using combustion or catalytic method are already developed and came onto the market. However, these systems require large initial cost and high running cost so do not widely used. In this study, atmospheric thermal plasma is applied for decomposition of N\textsubscript{2}O in anesthetic gas. With our multi-gas inductively coupled plasma (ICP) source, atmospheric plasma of anesthetic gas, which consists of N\textsubscript{2}O, O\textsubscript{2} and buffer air, can be directly generated\cite{2}-\cite{3}. Not only thermal decomposition but radicals, excited species and ultraviolet radiation will be expected for the treatment. Thus higher decomposition efficiency is expected.

In this work, decomposition of N\textsubscript{2}O in anesthetic gas using atmospheric multi-gas ICP was investigated. N\textsubscript{2}O/O\textsubscript{2}/air mixture gas plasma was generated by the plasma source then the composition of treated gas was measured. Effect of the RF input power and the sampling position on decomposition rate and decomposition efficiency of N\textsubscript{2}O were investigated. As a result, decomposition rate of over 99% was achieved and 1% NO\textsubscript{2} was generated as a by-product at the RF input power of 800 W. The decomposition efficiency was around 100 g/kWh. This value is about three times higher than the result of non-thermal atmospheric plasma.

![Fig. 1 Effect of RF power on N\textsubscript{2}O decomposition efficiency and N\textsubscript{2}O concentration](image)

**References**