Electronic Supplementary Material (ESI) for RSC Advances.


# Conversion of dilute nitrous oxide ($N_2O$) in $N_2$ and $N_2$-$O_2$ mixtures by plasma and plasma-catalytic processes

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## Figures S1 and S2

**Figs. S1** and **S2** show the effects of $N_2O$ presence in $N_2$-$O_2$ mixture on the production of NO and $NO_2$ by discharge in plasma (**Fig. S1**) and plasma-$Al_2O_3$ reactors (**Fig. S2**) at room temperature. As can be seen, the presence of low-concentration (100 ppm) $N_2O$ in the $N_2$-$O_2$ mixture hardly affected the formation behavior of NO and $NO_2$ in both plasma (**Fig. S1**) and plasma-$Al_2O_3$ reactors (**Fig. S2**) at room temperature.

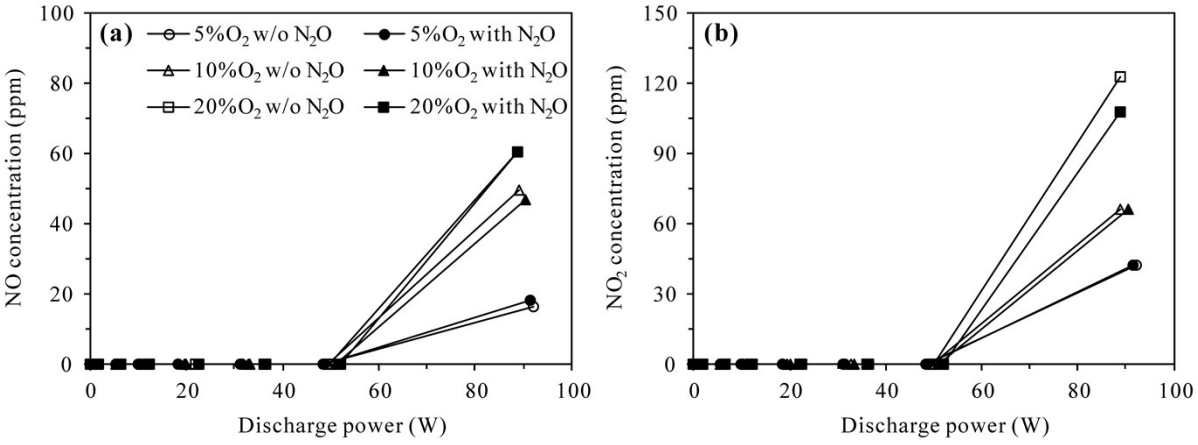


**Fig. S1** Effects of $N_2O$ presence in $N_2$-$O_2$ mixture on the production of (a) NO and (b) $NO_2$ by discharge in plasma reactor at room temperature (inlet $N_2O$: 0 or 100 ppm; $O_2$ content: 5%, 10% or 20%).

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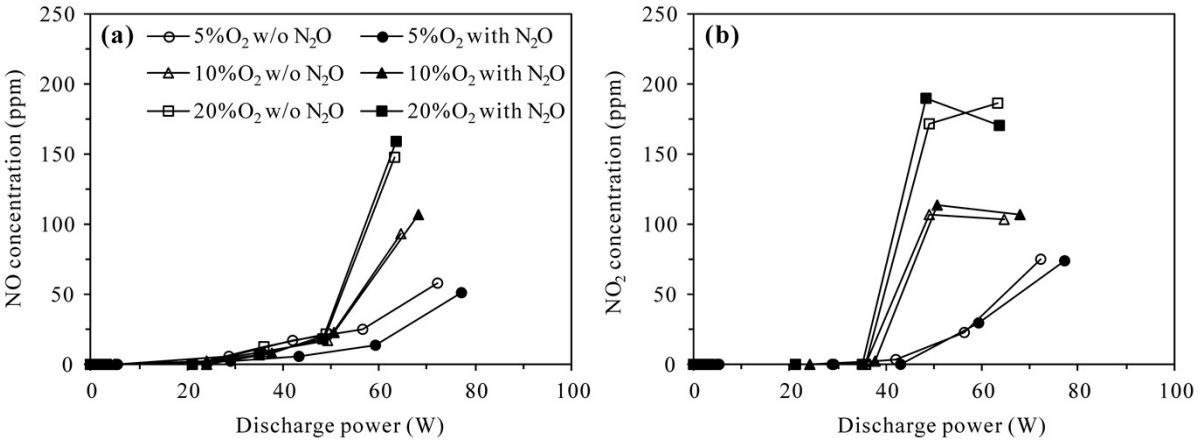
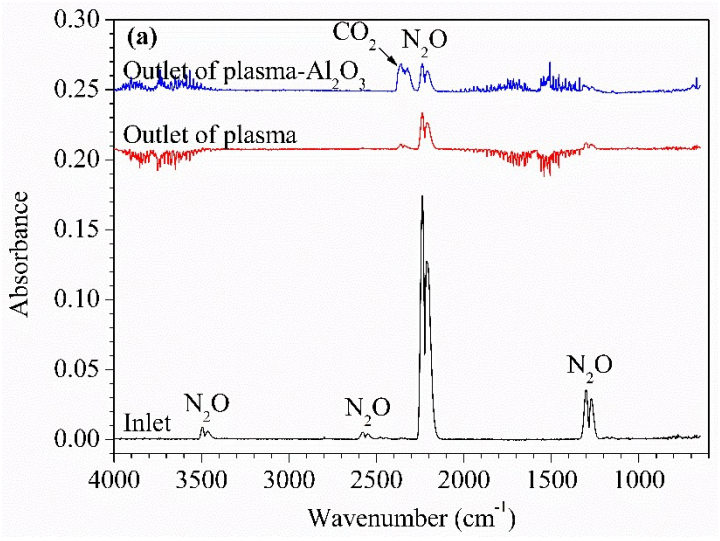



**Fig. S2** Effects of $N_2O$ presence in $N_2$-$O_2$ mixture on the production of (a) NO and (b) $NO_2$ by discharge in plasma-$Al_2O_3$ reactor at room temperature (inlet $N_2O$: 0 or 100 ppm; $O_2$ content: 5%, 10% or 20%).

## Figure S3

**Fig. S3** shows the FT-IR spectra of the reactor inlet and outlet gas for $N_2O$ decomposition under $N_2$ atmosphere at (a) room temperature and (b) 300 °C. It can be seen that besides the residual $N_2O$, no other nitrogen oxide species were detected during the plasma and plasma-catalytic decomposition of $N_2O$ under $N_2$ atmosphere regardless of the reaction temperature.



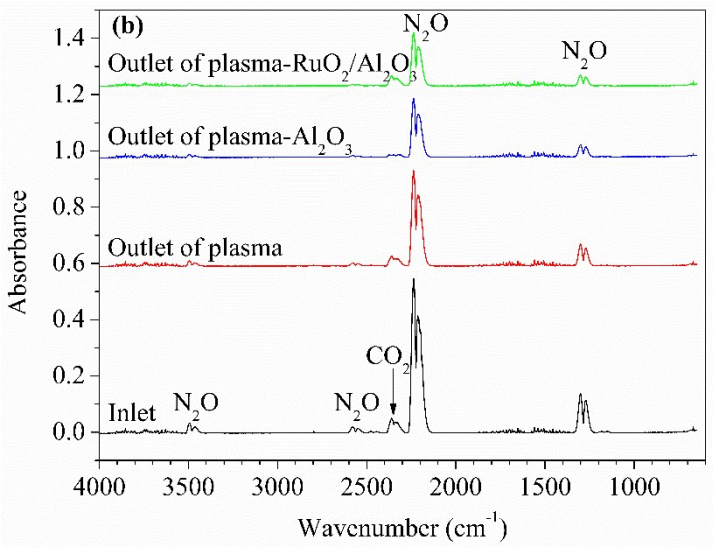



**Fig. S3** FT-IR spectra of the reactor inlet and outlet gas for $N_2O$ decomposition under $N_2$ atmosphere at (a) room temperature (inlet $N_2O$: 100 ppm; discharge power: 72 W for the plasma process and 60 W for the plasma-$Al_2O_3$ process) and (b) 300 °C (inlet $N_2O$: 400 ppm; discharge power: 22 W for the plasma process and 34 W for the plasma-catalytic process).

## Figure S4

**Fig. S4** shows the FT-IR spectra of the outlet gas of (a) plasma, (b) plasma-$Al_2O_3$ and (c) plasma-$RuO_2/Al_2O_3$ reactors with and without 400 ppm-$N_2O$ in the inlet gas ($O_2$ content 5%) and before and after discharge at 300 °C. It can be seen that discharge in $N_2$-$O_2$ mixture at 300 °C produced $N_2O$, NO and $NO_2$ as byproducts no matter the catalyst was introduced or not. When $N_2O$ was introduced into the $N_2$-$O_2$ mixture, besides the residual $N_2O$, NO and $NO_2$ were also detected at the outlet of plasma and plasma-catalytic reactors in the presence of discharge.

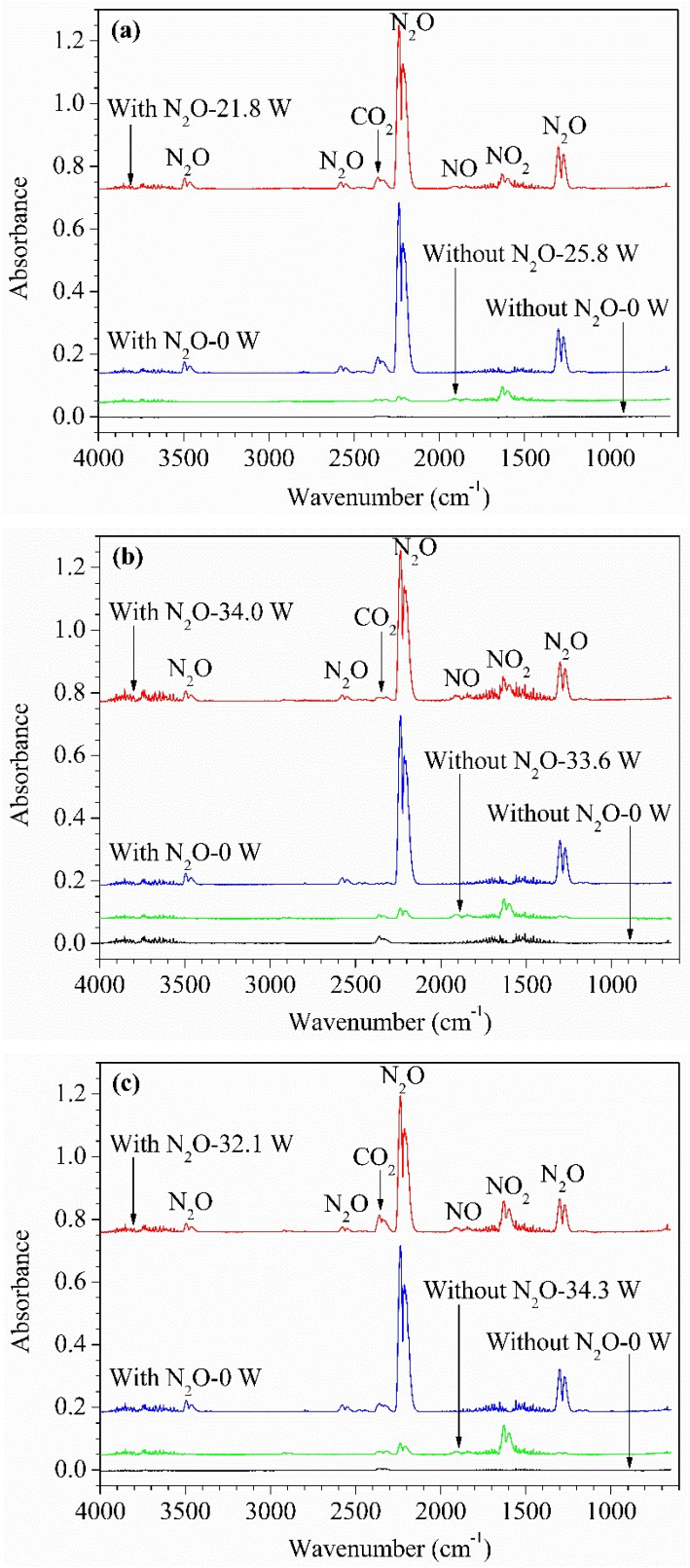



**Fig. S4** FT-IR spectra of the outlet gas of (a) plasma, (b) plasma-$Al_2O_3$ and (c) plasma-$RuO_2/Al_2O_3$ reactors with and without 400 ppm $N_2O$ in the inlet gas and before and after discharge at 300 °C ($O_2$ content: 5%).