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**Introduction:** The thin CO\textsubscript{2} atmosphere and strong oxidizing environment of Mars make it harsh and inhospitable for human survival. In-situ resource utilization to produce the supplies of life-sustaining materials such as O\textsubscript{2}, H\textsubscript{2}O and energy is the key technology for Human migration. Under low pressure about 600pa, the Martian atmosphere is nearly ideal for glow discharge which can generate O\textsubscript{2} and CO by decomposing CO\textsubscript{2} gas. Comparing to other methods of O\textsubscript{2} generation, CO\textsubscript{2} glow discharge under Mars conditions has several benefits such as lower-energy, lower-weight, higher-performance and easy to manufacture. In this study, several key parameters of CO\textsubscript{2} glow discharge related to the final yield of O\textsubscript{2} and CO\textsuperscript{[1,2]} were investigated.

**Experiment:** The purposes of our experiment were to detect the key CO\textsubscript{2} plasma reaction products (i.e., CO\textsubscript{2}, O\textsubscript{2}, O\textsubscript{3}) and calculate their reaction yields under Martian simulated conditions with various working parameters. The experiment was conducted in the Mars environmental simulation chamber (cylinder-shaped, diameter 15cm, height 40cm) which can hold an atmospheric components and pressure similar to that on the Mars surface. The experiment set-up was shown in Fig.1. Two self-made parallel rounded copper planes (diameter 20mm; thickness 10mm) were used as discharge electrodes with a gap of 2mm to 5mm. The CO\textsubscript{2} gas plasma can be generated between the two parallel electrodes when a certain high A.C. voltages were applied to the tow electrodes. In order to achieve those aims, three electrochemistry gas sensors were purchased to continuously in-situ detect the concentration of CO (Guangzhou Xinnuo Intelligent Equipment Co., Ltd., MIC-500S-CO), O\textsubscript{2} (Guangzhou Xinnuo Intelligent Equipment Co., Ltd., MIC-600-O2) and O\textsubscript{3} (Shenzhen Korno Import & Export Co., Ltd., WT-80-O3) by sampling end gas at fixed flow rate during CO\textsubscript{2} plasma reaction.

**Result:** As show in Fig.2, the concentration of O\textsubscript{2} and CO increased quickly at the beginning of CO\textsubscript{2} plasma generation, and then became stable because the dynamic balance of new generated O\textsubscript{2} and CO in the Mars chamber were achieved. Finally, the concentration of O\textsubscript{2} and CO reduced to zero after turning off the power supply of CO\textsubscript{2} plasma.

The value of stable concentration of O\textsubscript{2} and CO in Fig.2 means the stable yield of O\textsubscript{2} and CO which was used to calculate the final yield of reaction produces under various parameters. After parameter optimization (such as excitation power of CO\textsubscript{2} plasma, discharge voltage, discharge gap distant, gas pressure et al.), the biggest yield is 1.33g/hr for O\textsubscript{2} with plasma exciting power of 182.7W.

**Conclusion:** In this study, an experimental setup for O\textsubscript{2} generation were built using a Mars chamber and the main plasma reaction products of CO\textsubscript{2} gas, i.e. O\textsubscript{2} and CO were detected and optimized. Our results verify the feasibility of generating O\textsubscript{2} on the surface of Mars. And more results will be published soon.

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**References:**
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