Title: The study of plasma jet of argon and carbon dioxide gas mixture

Author(s): Ratcahnon wilaiwan **Student ID:** 650510378

Major: Physics

Advisor(s): Professor Dr.Dheerawan Boonyawan

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ABSTRACT

This study aims to investigate the effects of argon and carbon dioxide gas flow rates on the properties of plasma jets and the efficiency of carbon monoxide production at room temperature. A cold atmospheric plasma jet was employed as a chemical reaction activator under ambient conditions. The experiment involved varying the flow rates of argon 1 to 7 Lit per min and carbon dioxide 100 to 500 cc per min. The plasma characteristics analyzed through high-speed imaging and Optical Emission Spectroscopy (OES). In addition, the effects of plasma exposure on surface properties are examined by measuring the contact angle of treated glass substrates. The results revealed that gas flow rate significantly affected the plasma jet length, brightness, and stability. For pure argon plasma, the electron temperature decreased with increasing flow rate, while the variation in temperature became smaller. When CO_2 introduced, the electron temperature further decreased depending on the Ar/CO_2 ratio. The highest CO production efficiency obtained at an argon flow rate of 7 Lit per min and CO_2 flow rate of 100 cc per min at power level 3 (0.62 W). Moreover, plasma treatment on glass surfaces reduced the contact angle, indicating enhanced surface wettability. These results demonstrate that cold plasma can be used as an effective method to produce CO at room temperature, as CO has properties such as reducing inflammation and promoting wound healing, providing an initial idea for further medical applications of argon–carbon dioxide plasma produced by plasma jet.

Keywords: Plasma Jet, Carbon Monoxide Production, Plasma Medical