

## COMPARISON BETWEEN VOLUME AND SURFACE DBDs FOR C<sub>2</sub>H<sub>2</sub> REMOVAL

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**Abstract.** This study compares the results of a gas gap dielectric barrier discharge (DBD) and a surface DBD for C<sub>2</sub>H<sub>2</sub> removal and O<sub>3</sub> production. In both cases, the surface DBD is found to be more efficient. When a photocatalytic material (TiO<sub>2</sub>) is introduced into the reactor, it increases the C<sub>2</sub>H<sub>2</sub> removal and O<sub>3</sub> production of the gas gap DBD, and has no effect on the surface DBD results. Finally, the material is found to increase the injected energy in the two configurations. iCCD imaging of the surface DBD shows that the material strongly influences the discharge behavior.

### 1. INTRODUCTION

Dielectric barrier discharges (DBDs) at atmospheric pressure are widely used for environmental applications [1]. The synergy between these discharges and a photocatalyst for VOC removal is investigated since the last ten years [2]. TiO<sub>2</sub> is the most studied photocatalyst and leads to CO<sub>2</sub> and CO as oxidation products with a high CO<sub>2</sub> selectivity [3]. Previous studies have showed the role of O atoms for VOC removal [4]. The importance of the dielectric surface in O and O<sub>3</sub> production has also been demonstrated [5]. Finally, the photocatalytic material has a strong influence on the discharge behaviour, and a real synergy between plasma and photocatalytic activity of TiO<sub>2</sub> has been shown [6, 7]. In this paper, we propose to compare the destruction of the acetylene molecule (C<sub>2</sub>H<sub>2</sub>) and O<sub>3</sub> production by two DBDs setups: a cylindrical discharge [6] and a surface discharge [8]. The influence of the material on the discharge is discussed using iCCD imaging.

### 2. EXPERIMENTAL SETUP

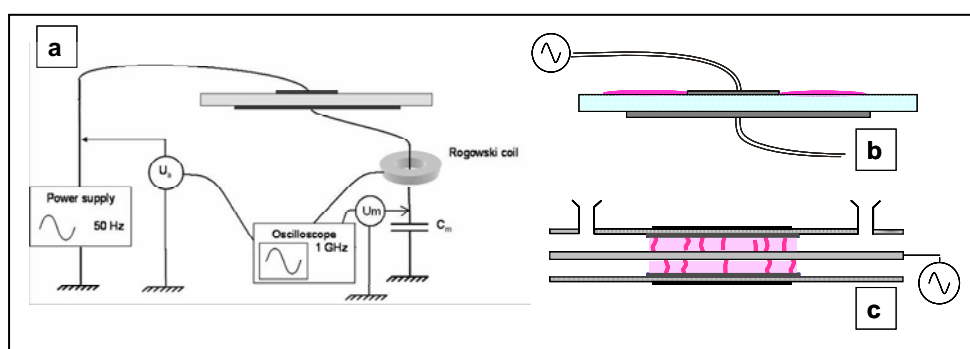


FIGURE 1. Experimental setup.

The electrical circuit is showed on figure 1 (a). Two discharge setups are compared:

- The surface setup (figure 1(b)) consists of two aluminium electrodes glued to both sides of a glass plate. The dielectric thickness is 2 mm, excepted for figure 4(a) where it is 4 mm. The upper electrode is 6 cm for 2 cm width. The lower electrode is larger (6 cm for 8 cm width),

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