Experimental Evaluation of Odor Treatment for discharge plasma by using ceramic tube

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***Abstract*— The odor removal technology in this research is the new technology which emits the discharge plasma in the area of AC, and through the research discharge plasma-ozone-absorption filter is accomplished as process system. In order for this, we combine the advantages of chemical technology, a discharge plasma technology, and ozone absorption filter technology together and emit the plasma on the odor materials that is collected in first step. Through this process, we are able to see that hydrogen sulfide, ammonia, merkaptanryu, trimetalamines and volatile organic compounds, bacteria, etc. which are major cause of various ill odor are removed, and through passing the plasma generator which makes free radicals that is ten times more powerful than ozone sterilizer, the rest of the odor substances is removed by redox reactions. In the third step, the rest of zone is absorbed and emitted into the air by using the absorption filter. The rate of efficiency as the result of this research is 99%, using 5 ㎥/min ceramic tube and applying 15m/sec wind and 360mm/Aq pressure**.

I. INTRODUCTION

Plasma relation techniques are come, being applied from the environmental contamination control technical background including an air pollution, ozone control etc. technique and they do not divide not to be, alias does and as Plasma comes to soak, is mixed. So there is a possibility of seeing like this name frequently from general family electrical appliance etc. But Plasma relation techniques the application field develops and environmental industry is developmental at class speed. The plasma the element inflicts the electric charge of high voltage and the high frequency in the ion and the electron moves and actively, makes and the element the active radical where the reaction is easy the ion chemically creates from and to oxidize the offensive odor substance. Therefore ozone seizure and different point ozone seizure the ozone which is an oxidizer which is powerful occurs and with the of-

fensive odor substance the other side which gets up a reaction, plasma control offensive odor substance oneself oxidizing with radical reaction, the reaction velocity which sees happens quickly. But the problem which important the research description below for the efficiency of plasma occurrence system on a large scale is in the process of advancing and is efficiency of the plasma discharge tube, in order to increase important efficiency of the discharge tube is appearing with the variable which shape etc. of size and the electrode of quality of material and the discharge tube of form and the discharge tube of impressed voltage is.

II. EXPERIMENTAL APPARATUS

The discharge tube used 6 ceramic tubes, the diameter of the ceramic tube was 6ϕ, to each ceramic tube used stenless steel of 3ϕ with the electrode. The outside of the ceramic tube was covered with the aluminum mesh and covered again the whole ceramic tube with the aluminum mesh. finally, this put in the acryl tube and fixed. The voltage adjusted 10kV 60W. To the discharge tube 5 m^3/min 15m/sec wind velocities were authorized at control dosage of time.

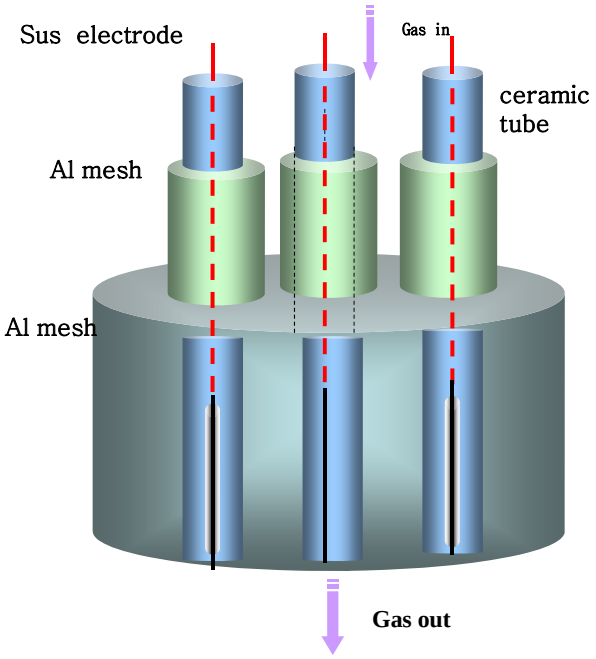


Fig.1 schemetic diagram of discharge tube

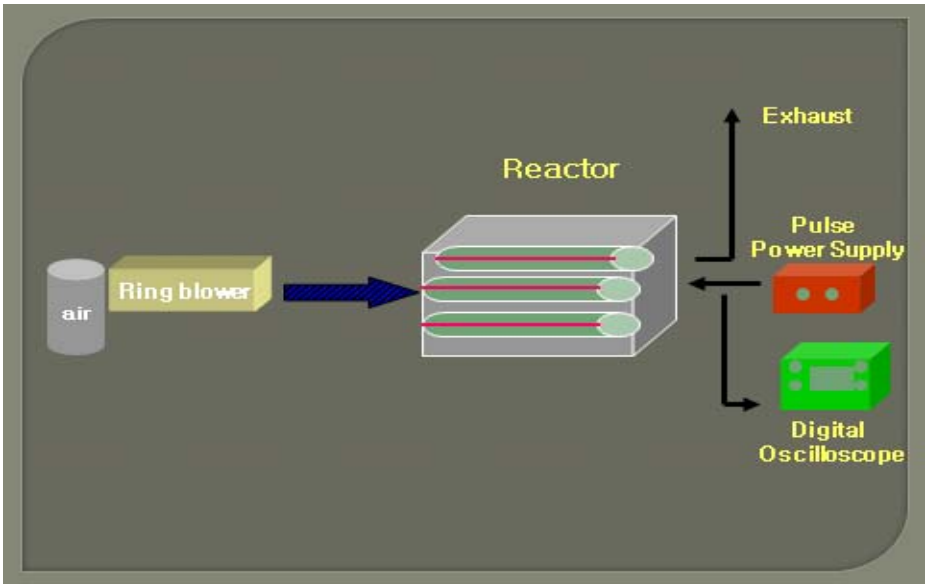


Fig.2 schemetic diagram of experimental apparatus

The air proximity establishes the injection nozzle at rapid pace will can jet on discharge tube entrance side of the plasma reaction apparatus inside with, from the minute description injection nozzle internal furnace discharge tube to jet the jet air which is jetted, will expand the plasma reaction territory where the contaminated gas reacts and will be able to control a reaction time enough long and there is an effect the offensive odor removal efficiency of the contaminated gas on a large scale will be able to improve. The impurity which together, contains within the plasma discharge at the time of contaminated gas (the dust, adhesiveness material etc.) there is a possibility also the effect will be able to minimize the arc occurrence department contamination in compliance with getting. The nozzle hole in order for at 1mm to 2mm degree to form with the instantaneous velocity of air to move with 10m/sec to 30m/sec very small quickly from plasma occurrence department of the discharge tube, is desirable. Like this air (the jet air) is quick according to flowing, the plasma which creates from plasma occurrence department moves with a top and expands a plasma reaction territory about the contaminated gas.

III. EXPERIMENTAL RESULTS

From the injection nozzle the jet air which is supplied with the oxygen and the moisture in air and leads from experiment rig and reacts if the equipment which ozonator etc. for an ozone commitment is unnecessary the oxidation radical which is an oxide which is po-

werful (promotes OH radical) creations with, like existing and does not use, has the strong point.

5 ㎥/min contaminated gases are controlled from this experiment, the creation of the contaminated gas which is controlled with table 1 is same

TABLE 1: THE CREATION OF THE CONTAMINATIONED GAS

ELEMENT	NH_3	H_2S	TRIMETIL AMIN	TVOC
CONCENTRATION(PPM)	100	100	100	100

From here, TVOC was consisted of Toluen and Aldehide etc.

When plasma occurrence the voltage occurs normally from above of 5kv and the voltage exceeds 8kV, NOx occurrences quantity increase and, this comes to seem in compliance with the destruction of the nitrogen in the air which is caused by with energy oversupply with the fact that occurs.

FIG.3: TREATMENT RESULT FOR VOLTAGE EFFECTS

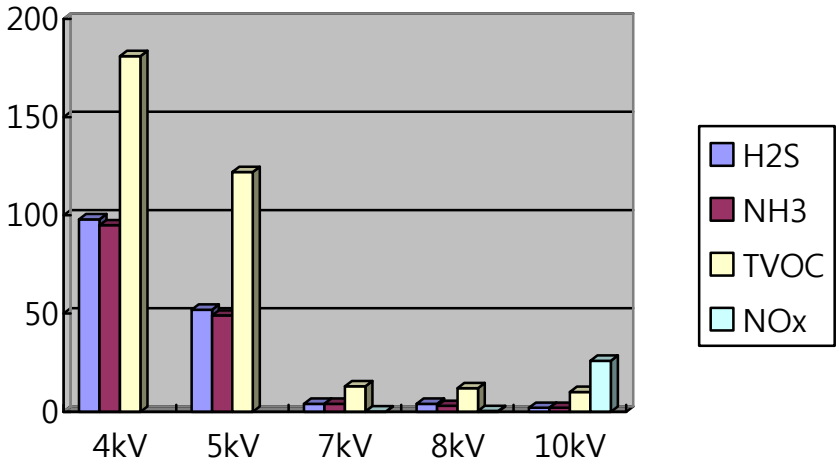
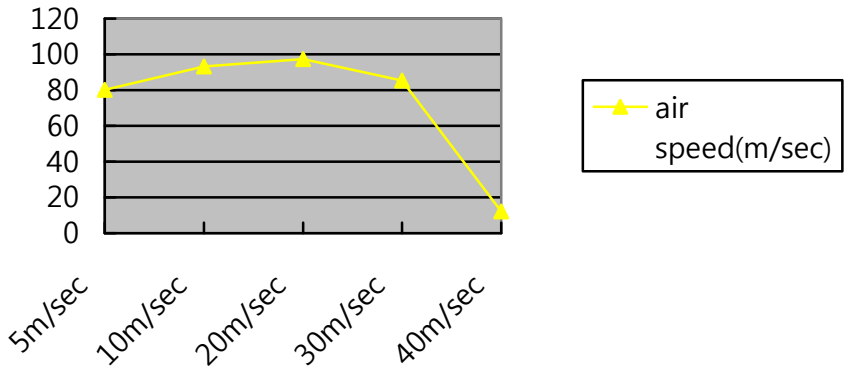


Fig4: treatment ratio for appling air speed



THE INJECTION NOZZLE EXPANDS A PLASMA OCCURRENCE TERRITORY AND SUPPLIES HELPS GETS UP THE PLASMA REACTION WHICH IS STABLE INFLUENCES THE OXYGEN AND THE MOISTURE AND TO OXIDATION REACTION. EXPERIMENTAL RESULT AND THE INJECTION NOZZLE LEADS AND THE AIR WHICH FLOWS (THE JET AIR) THE TERRITORY OF THE RECORDING PLASMA WHERE THE FLUX WILL BE QUICK INCREASES AND THE CONTAMINANT REMOVAL EFFICIENCY IMPROVES, TO EXCEED 20M/SEC TO 30M/SEC FLUX, THE EFFICIENCY FALLING, STARTS. THE EFFICIENCY SUDDENLY FALLS WITH 30M/SEC, AFTER THAT, THE PLASMA WHERE THE FLUX CREATES TOO QUICKLY SPREADS AND DOES NOT EXPAND A PLASMA TERRITORY NOT TO BE ABLE, IS THOUGHT THE BECAUSE BEING TERMINATED EARLY

REFERENCE

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[4] H.K.LEE et al., Device for removing odorous gas using plasma discharge, patent for KIPO, 10-2009-0133610, 2009.