What is Claimed is:

1. An apparatus for treating gaseous pollutant with plasma comprising:

a microwave source configured to generate a microwave oscillation;

a waveguide component coupled to the microwave source and configured to receive the microwave oscillation such that the microwave oscillation is propagated through the waveguide component; and

a resonant cavity coupled to the waveguide component such that the microwave oscillation is substantially propagated in the resonant cavity along a waveguide direction, the resonant cavity comprising a first chamber in proximity to the waveguide component and a second chamber distant from the waveguide component, the first chamber comprising an inlet end connected to the waveguide component and an outlet end opposite to the waveguide component, the second chamber comprising a communicating end communicated with the outlet end and a closed end opposite to the communicating end, the second chamber being configured to receive the microwave oscillation passed through the first chamber, the microwave oscillation interacting with an ignition gas in the second chamber to generate a torch;

wherein, the waveguide direction is substantially parallel to a reference axis defined in the first chamber, the first chamber comprises an inner wall around the reference axis and extending along the reference axis, the inner wall comprises a first region

inclined to the reference axis and a second region substantially parallel in respect to the reference axis, an area of the first region is larger than that of the second region so that the first chamber comprises a tapered shaped space which becomes narrower from the inlet end to the outlet end.

2. The apparatus for treating gaseous pollutant with plasma according to claim 1, wherein the inner wall comprises a first inner side wall and a second inner side wall opposite to the first inner side wall, and the first inner side wall and the second inner side wall respectively obliquely incline inwardly toward the reference axis from the inlet end to the outlet end.

3. The apparatus for treating gaseous pollutant with plasma according to claim 1, wherein the inner wall comprises a first inner side wall and a second inner side wall opposite to the first inner side wall, and a width between the first inner side wall and the second inner side wall is gradually decreasing along the reference axis.

4. The apparatus for treating gaseous pollutant with plasma according to claim 1, wherein the inner wall of the first chamber comprises a first top wall and a first bottom wall, the second chamber comprises a second top wall and a second bottom wall, and a first difference in height is provided between the second top wall and the first top wall.

5. The apparatus for treating gaseous pollutant with plasma according to claim 1, wherein the inner wall of the first chamber comprises a first top wall and a first bottom wall, the second chamber comprises a second top wall and a second bottom wall, and a second difference

in height is provided between the second bottom wall and the first bottom wall.

6. The apparatus for treating gaseous pollutant with plasma according to claim 1, further comprising an ignition source and a dielectric tube, wherein the dielectric tube is inserted in the second chamber and comprises a first end close to the ignition source and a second end distant from the ignition source, the second chamber comprises a second top wall and a second bottom wall, the second end of the dielectric tube protrudes out from the second chamber and a third difference in height is provided between the second end of the dielectric tube and the second bottom wall of the second chamber.

7. The apparatus for treating gaseous pollutant with plasma according to claim 1, further comprising an ignition source and a dielectric tube, wherein the dielectric tube is inserted in the second chamber, the ignition source comprises a probe component, the probe component comprises a support member and at least one tip disposed on the support member, and the tip having an outer diameter between 1.6 mm and 2 mm.

8. The apparatus for treating gaseous pollutant with plasma according to claim 1, wherein the ignition gas is selected from a group consisting of air, nitrogen, and argon.

9. An apparatus for treating gaseous pollutant with plasma comprising:

a microwave source configured to generate a microwave oscillation;

a waveguide component coupled to the microwave source and

configured to receive the microwave oscillation such that the microwave oscillation is propagated through the waveguide component; and

a resonant cavity coupled to the waveguide component such that the microwave oscillation is substantially propagated in the resonant cavity along a waveguide direction, the resonant cavity comprising a first chamber in proximity to the waveguide component and a second chamber distant from the waveguide component, the first chamber comprising an inlet end connected to the waveguide component and an outlet end opposite to the waveguide component, the second chamber comprising a communicating end communicated with the outlet end and a closed end opposite to the communicating end, the second chamber being configured to receive the microwave oscillation passed through the first chamber, the microwave oscillation interacting with an ignition gas in the second chamber to generate a torch;

wherein, the waveguide direction is substantially parallel to a reference axis defined in the first chamber, the first chamber comprises a first inner side wall, a second inner side wall opposite to the first inner side wall, a first top wall, and a first bottom wall, the first inner side wall and the second inner side wall obliquely incline inwardly toward the reference axis from the inlet end to the outlet end.

10. The apparatus for treating gaseous pollutant with plasma according to claim 9, wherein a width between the first inner side wall and the

second inner side wall is gradually decreasing along the reference axis.

11. The apparatus for treating gaseous pollutant with plasma according to claim 9, wherein the second chamber comprises a second top wall and a second bottom wall, and a first difference in height is provided between the second top wall and the first top wall of the first chamber.

12. The apparatus for treating gaseous pollutant with plasma according to claim 9, wherein the second chamber comprises a second top wall and a second bottom wall, and a second difference in height is provided between the second bottom wall and the first bottom wall of the first chamber.

13. The apparatus for treating gaseous pollutant with plasma according to claim 9, further comprising an ignition source and a dielectric tube, wherein the dielectric tube is inserted in the second chamber and comprises a first end in proximity to the ignition source and a second end distant from the ignition source, the second chamber comprises a second top wall and a second bottom wall, the second end of the dielectric tube protrudes out from the second chamber and a third difference in height is provided between the second end of the dielectric tube and the second bottom wall of the second chamber.

14. The apparatus for treating gaseous pollutant with plasma according to claim 9, further comprising an ignition source and a dielectric tube, wherein the dielectric tube is inserted in the second chamber, the ignition source comprises a probe component, the probe component comprises a support member and at least one tip disposed on the

support member, and the tip having an outer diameter between 1.6 mm and 2 mm.

~~15. An apparatus for treating gaseous pollutant without requiring fuel comprising:~~

~~a microwave source configured to generate a microwave oscillation;~~

~~a waveguide component coupled to the microwave source and configured to receive the microwave oscillation such that the microwave oscillation is propagated through the waveguide component; and~~

~~a resonant cavity coupled to the waveguide component and extending along a waveguide direction, the resonant cavity comprising a tapered chamber in proximity to the waveguide component and a combustion chamber distant from the waveguide component, the combustion chamber being configured to receive the microwave oscillation passed through the tapered chamber, and the microwave oscillation interacting with a non-fuel ignition gas in the combustion chamber to generate a torch.~~

~~16. The apparatus for treating gaseous pollutant without requiring fuel according to claim 15, wherein the tapered chamber comprises a first top wall and a first bottom wall, the combustion chamber comprises a second top wall and a second bottom wall, and a first difference in height is provided between the second top wall and a bottom end of the first top wall.~~

~~17. The apparatus for treating gaseous pollutant without requiring fuel~~

~~according to claim 15, wherein an inner wall of the tapered chamber comprises a first top wall and a first bottom wall, the combustion chamber comprises a second top wall and a second bottom wall, and a second difference in height is provided between the second bottom wall and the first bottom wall.~~

~~18. The apparatus for treating gaseous pollutant without requiring fuel according to claim 15, further comprising an ignition source and a dielectric tube, wherein the dielectric tube is inserted in the combustion chamber and comprises a first end in proximity to the ignition source and a second end distant from the ignition source, the combustion chamber comprises a second top wall and a second bottom wall, the second end of the dielectric tube protrudes out from the combustion chamber and a third difference in height is provided between the second end of the dielectric tube and the combustion chamber.~~