

What is claimed is:

1. A plasma generating system, comprising:

a waveguide for transmitting a microwave energy therethrough;

an inner wall disposed within the waveguide to define a plasma cavity, a plasma being generated within the plasma cavity using the microwave energy;

a first gas inlet mounted on a first side of the waveguide and configured to introduce a first gas into the plasma cavity and generate a first vortex flow within the plasma cavity using the first gas, the first gas inlet having a hole through which a gas processed by the plasma exits the plasma cavity; and

a plasma stabilizer having a shape of a circular hollow cylinder and installed on a second side of the waveguide and protruding into the plasma cavity, a longitudinal direction of the plasma stabilizer being parallel to a rotational axis of the first vortex flow.

2. The plasma generating system as recited in claim 1, wherein the inner wall is formed of a material that is transparent to the microwave energy.

3. The plasma generating system as recited in claim 1, wherein the first vortex flow has an outer region that proceeds toward the second side of the waveguide in a helical motion and an inner region that proceeds toward the first side of the waveguide in a helical motion and wherein the plasma is generated in the inner region of the first vortex flow.

4. The plasma generating system as recited in claim 1, wherein the first gas inlet has one or more passageways through which the first gas is introduced into the plasma cavity and each of the one or more passageways is arranged to impart a vortical motion to the first gas that passes therethrough.

5. The plasma generating system as recited in claim 1, further comprising:

a second gas inlet mounted on the second side of the waveguide and configured to introduce a second gas toward the plasma stabilizer,

wherein the second gas inlet is configured to generate a second vortex flow within the plasma cavity using the second gas.

6. The plasma generating system as recited in claim 5, wherein the second vortex flow is located inside the first vortex flow and the plasma is generated in the second vortex flow.
7. The plasma generating system as recited in claim 5, wherein the second gas inlet includes one or more passageways through which the second gas flows and each of the one or more passageways is arranged to impart a vortical motion to the second gas that passes therethrough.
8. The plasma generating system as recited in claim 5, wherein a flow rate of the second gas ranges 5 - 95 % by mass of a total flow rate of gas flowing into the plasma cavity.
9. The plasma generating system as recited in claim 1, wherein at least one of the inner wall and the plasma stabilizer has a surface that is rifled to impart helical motion to a gas that is in contact with the surface.