CLAIMS

1. A combustion and heat exchange assembly of a solid oxide fuel cell (SOFC) system, comprising: a casing (1) and a partition (12) arranged inside the casing (1), wherein the partition (12) divides the interior of the casing (1) into a combustion chamber and a heat exchange chamber; a combustion unit arranged inside the combustion chamber, comprising: an igniter (5); a combustion nozzle (10); a fuel gas supply pipe; and an air director; wherein: the combustion nozzle (10) comprises a central cavity and a plurality of flame channels in communication with the central cavity; a plurality of through holes for projecting flames are arranged on a side of the flame channels adjacent to the partition (12); and the air director is used for directing air into the central cavity; and a heat exchange unit (2) arranged inside the heat exchange chamber, wherein the heat exchange unit (2) comprises a cold channel and a hot channel, which are independent of each other, and a gas flow port in communication with the hot channel is arranged on the partition (12).

2. The combustion and heat exchange assembly according to claim 1, further comprising a flame monitor arranged on the upper side of the combustion nozzle (10).

3. The combustion and heat exchange assembly according to claim 1 or 2, further comprising a flame holder (11) arranged on a side of the combustion nozzle (10) adjacent to the partition (12).

4. The combustion and heat exchange assembly according to claim 3, wherein: a cross section of the flame holder (11) is in a shape of a continuous W; the flame holder (11) is internally provided with a plurality of W-shaped channels; an end face of the flame holder (11) farther from the partition (12) is provided with a plurality of inlets; and an end face of the flame holder (11) adjacent to the partition (12) is provided with a plurality of outlets.

5. The combustion and heat exchange assembly according to any preceding claim, further comprising a catalytic burner (3) arranged on a side of the combustion nozzle (10)

adjacent to the partition (12), wherein the catalytic burner (3) has a porous plate structure, and the porous plate structure is coated with a catalyst.

6. The combustion and heat exchange assembly according to any preceding claim, wherein the combustion and heat exchange assembly further comprises: an air shunt (9), which comprises a first outlet (9a) and a second outlet (9b); and an isolation hood (4) arranged inside the combustion chamber; wherein: the isolation hood (4) covers above the igniter (5), the air director, and the combustion nozzle (10); the first outlet (9a) of the air shunt (9) is in communication with the interior of the isolation hood (4) and with the air director; the second outlet (9b) of the air shunt (9) is in communication with the exterior of the isolation hood (4); and combustion tail gas discharged from the isolation hood (4) is directed to enter the hot channel after being mixed with the air outside the isolation hood (4).

7. The combustion and heat exchange assembly according to any preceding claim, wherein the fuel gas supply pipe comprises a convergence section and a sub-supply section, and the sub-supply section comprises a first pipe (6) and a second pipe (7) arranged in parallel.

8. The combustion and heat exchange assembly according to any preceding claim, wherein the heat exchange unit (2) comprises a plurality of heat exchange fins (2a).

9. The combustion and heat exchange assembly according to any preceding claim, wherein the flame channels include an annular channel (10a) and a plurality of radial channels (10b), wherein one end of each of the radial channels (10b) is in communication with the central cavity and the other end is in communication with the annular channel (10a).

10. An SOFC system, wherein the SOFC system comprises the combustion and heat exchange assembly according to any one of claims 1 to 9