CLAIMS

1. A method for preparing high-temperature and active particles-enriched steam by using plasma, comprising the following steps:

    1) preparing a steam; selecting one or several non-oxidizing gases as a working gas; ionizing the working gas into a high-temperature plasma working medium by using a plasma generator; and

    2) injecting the high-temperature plasma working medium into a high-temperature steam generator to form high-temperature ionized environment while introducing the steam through a rotary guide vane into the high-temperature steam generator at a high speed for allowing the steam to contact with the high-temperature plasma working medium so that the steam is heated and activated to form an active particles-enriched steam;

    wherein between 1 and 4 annular gaps are arranged at intervals on a housing of the high-temperature steam generator; and

    wherein part of the steam is guided through the annular gaps into the high-temperature steam generator by a pressure conveyor and forms a low temperature water film on a wall of the high-temperature steam generator for protection.

2. The method of claim 1, **characterized in that** the working gas in step 1) is ionized into high-temperature plasma having a temperature of between 3,000 and 12,000 K by the plasma generator.

3. The method of claim 1 or 2, **characterized in that** the working gas is nitrogen.

4. The method of claim 1 or 2, **characterized in that**

the high-temperature plasma working medium in step 2) is injected into the high-temperature steam generator at a speed of between 30 and 100 m/s;

the steam is injected into the high-temperature steam generator at a speed of between 5 and 30 m/s; and

a mass flow ratio between the high-temperature plasma working medium and steam into the high-temperature steam generator is adjusted for enabling the steam at an outlet of the high-temperature steam generator to have a temperature of between 1,000 and 4,000 K.

~~5. The method of claim 1 or 2, **characterized in that**~~

~~between 1 and 4 annular gaps are arranged at intervals on a housing of the high-temperature steam generator; and~~

~~part of the steam is guided through the annular gaps into the high-temperature steam generator by a pressure conveyor and forms a low-temperature water film on a wall of the high-temperature steam generator for protection.~~

~~6.~~5. The method of claim 1 or 2, **characterized in that** the steam input into the high-temperature steam generator is a saturated steam.

~~7.~~6. A device for preparing high-temperature and active particles-enriched steam by using plasma, comprising:

a plasma generator (1); and

a high-temperature steam generator (2);

characterized in that

a high-temperature plasma inlet (4) is arranged at a central part of one end of the high-temperature steam generator (2) and communicates with an outlet (1b) of the plasma generator (1);

the plasma generator (1) is provided with a non-oxidizing gas inlet (1a);

an annular steam inlet (3d) is provided to surround the high-temperature plasma inlet (4); and

a rotary guide vane (7) is disposed inside the annular steam inlet (3d).

~~8.~~7. The device of claim 7, **characterized in that**

the high-temperature steam generator (2) comprises a housing in a gradually enlarged step structure;

the housing comprises between 1 and 4 steps;

an annular gap is arranged between every two adjacent steps of the housing for allowing the steam to enter the high-temperature steam generator; and

the annular gaps are connected to a pressure conveyor.

~~9.~~8. The device of claim 8, **characterized in that** each of the gradually enlarged steps of the housing of the high-temperature steam generator has a length of between 300 and 800 mm.

~~10.~~9. The device of claim 8, **characterized in that** the annular gap has a radial width of between 3 and 15 mm.