CLAIMS

What is claimed is:

1. A turbine system component for a turbine system, the turbine system component comprising:

a body having an exterior surface;

a first cooling passage defined in the body and extending to an exterior surface of the body, the first cooling passage having a first cross-sectional area;

a hollow member coupled in the first cooling passage and defining a first exit opening at the exterior surface of the body, the first exit opening in the hollow member having a second cross-sectional area that is less than the first cross-sectional area; and

a second cooling passage defined in the body and extending to an exterior surface of the body, the second cooling passage having the first cross-sectional area and defining a second exit opening at the exterior surface of the body having the first cross-sectional area,

wherein the hollow member is made of a material having a melt temperature higher than an operating temperature of the turbine system.

2. The turbine system component of claim 1, wherein a first plurality of cooling passages is defined in the body, wherein each of the first plurality of cooling passages is substantially identical to the first cooling passage, and

wherein a respective hollow member defines a respective first exit opening at the exterior surface of the body having the second cross-sectional area for each of the first plurality of cooling passages.

3. The turbine system component of claim 2, wherein a second plurality of cooling passages is defined in the body, wherein each of the second plurality of cooling passages is substantially identical to the second cooling passage, has the first cross-sectional area in the body, and exits the exterior surface of the body at a second exit opening defined in the body having the first cross-sectional area.

4. The turbine system component of claim 3, wherein the first exit openings of the first plurality of cooling passages and the second exit openings of the second plurality of cooling passages alternate along the exterior surface of the body.

5. The turbine system component of claim 3, wherein the first plurality of cooling passages and the second plurality of cooling passages are arranged in a non-repeating pattern.

6. The turbine system component of claim 3, wherein the first plurality of cooling passages and the second plurality of cooling passages are arranged in a repeating pattern.

7. The turbine system component of claim 1, wherein the hollow member is coupled in the cooling passage in the body by a braze material.

8. The turbine system component of claim 7, wherein the braze material has a maximum thickness of 300 micrometers (μm).

9. The turbine system component of claim 1, wherein the body includes a nickel or cobalt-based superalloy, and the hollow member includes a nickel-chromium-based superalloy, a cobalt-based superalloy, or a stainless steel.

10. The turbine system component of claim 1, wherein the hollow member extends inwardly of the exterior surface at the exit opening no less than a hydraulic diameter of the cooling passage.

11. The turbine system component of claim 1, wherein the second cross-sectional area is 30% to 50% of the first cross-sectional area.

12. The turbine system component of claim 1, wherein the hollow member has a minimum wall thickness in a range of 0.1 to 0.3 millimeters.

13. The turbine system component of claim 1, wherein the body is part of a hot gas path component of the turbine system.

14. The turbine system component of claim 1, wherein the hollow member has an external cross-section having a shape corresponding to a shape of an internal cross-section of at least a portion of the cooling passage, and wherein the hollow member has an internal cross-section having a shape that differs from the shape of the external cross-section of the hollow member.

15. The turbine system component of claim 1, wherein the hollow member has a third cross-sectional area at a location distal to the first exit opening and internal to the body,

wherein the third cross-sectional area is different than the second cross-sectional area at the first exit opening.

16. The turbine system component of claim 1, wherein the cooling passage includes a plurality of turbulators on an interior surface thereof.

17. A turbine system component for a turbine system, the turbine system component comprising:

a body having an exterior surface;

a cooling passage defined in the body and extending to an exterior surface of the body, the cooling passage having a first cross-sectional area, the cooling passage including:

a first plurality of cooling passages defined in the body, each of the first plurality of cooling passages having the first cross-sectional area; and

a second plurality of cooling passages defined in the body, each of the second plurality of cooling passages having the first cross-sectional area in the body and exiting the exterior surface of the body at a second exit opening defined in the body having the first cross-sectional area; and

a hollow member coupled in the cooling passage and defining a first exit opening at the exterior surface of the body, the first exit opening in the hollow member having a second cross-sectional area that is less than the first cross-sectional area,

wherein the hollow member is made of a material having a melt temperature higher than an operating temperature of the turbine system, and

wherein the hollow member has an external cross-section having a shape corresponding to a shape of an internal cross-section of at least a corresponding portion of the cooling passage, wherein the hollow member has an internal cross-section having a shape that differs from the shape of the external cross-section of the hollow member, and wherein the shape of the internal cross-section of the hollow member is continuous over an entire length of the hollow member, and further wherein a respective hollow member defines the first exit opening at the exterior surface of the body having the second cross-sectional area for each of the first plurality of cooling passages.

18. The turbine system component of claim 17, wherein the shape of the internal cross-section of the hollow member is constant over the entire length of the hollow member.

19. The turbine system component of claim 17, wherein the size of the internal cross-section of the hollow member is constant over the entire length of the hollow member.

20. The turbine system component of claim 17, wherein the size of the internal cross-section of the hollow member varies over the length of the hollow member.

21. The turbine system component of claim 17, wherein the shape of the internal cross-section of the hollow member changes over the length of the hollow member.

22. The turbine system component of claim 17, wherein the first exit openings of the first plurality of cooling passages and the second exit openings of the second plurality of cooling passages are arranged in a non-repeating pattern.

23. The turbine system component of claim 17, wherein the first exit openings of the first plurality of cooling passages and the second exit openings of the second plurality of cooling passages are arranged in a repeating pattern.

24. The turbine system component of claim 23, wherein the first exit openings of the first plurality of cooling passages and the second exit openings of the second plurality of cooling passages alternate along the exterior surface of the body, thereby forming the repeating pattern.

25. The turbine system component of claim 17, wherein the hollow member is coupled in the cooling passage in the body by a braze material.