CLAIMS

What is claimed is:

1. An automated system for analyzing layer thickness of a multilayer component, the automated system comprising:

a manipulator coupled to:

an opening forming device configured to create an opening having a predefined geometry partially into the multilayer component at a selected location on a surface of the multilayer component, wherein the multilayer component comprises a plurality of material layers including at least a substrate and a bond coat, and wherein the opening exposes each of the plurality of material layers; and

an imaging device configured to create an image of the exposed plurality of material layers in the opening;

a processor configured to calculate at least a thickness of the bond coat of the exposed plurality of material layers from the image and based on the predefined geometry of the opening, wherein the plurality of material layers further includes a depletion layer extending over the bond coat; and

the processor is further configured to determine a thickness of the depletion layer, and determine a life expectancy of the bond coat based on the at least one of the thickness of the depletion layer and the thickness of the bond coat .

2. The automated system of claim 1, wherein at least one of the opening forming device and the imaging device are coupled to the manipulator in the form of attachments attached to the manipulator.

3. The automated system of claim 1, wherein at least one of the opening forming device and the imaging device are coupled to the manipulator in the form of tools separate from the manipulator.

4. The automated system of claim 1, wherein the manipulator is further coupled to at least one of a contrast increasing device configured to increase a contrast of the exposed plurality

of material layers in the opening, a repairing device configured to repair the opening, and a TBC layer removing device.

5. The automated system of claim 4, wherein at least one of the contrast increasing device, the repairing device, and the TBC layer removing device are coupled to the manipulator in the form of attachments attached to the manipulator.

6. The automated system of claim 4, wherein at least one of the contrast increasing device, the repairing device, and the TBC layer removing device are coupled to the manipulator in the form of tools separate from the manipulator.

7. The automated system of claim 1, further comprising a controller and/or a power supply.

8. The automated system of claim 1, wherein the manipulator is configured to receive a multilayer component that has been dismounted from a use setting.

9. The automated system of claim 8, wherein the use setting is inside a turbine.

10. The automated system of claim 8, wherein the multilayer component is used in an airfoil.

11. The automated system of claim 8, wherein the multilayer component is used in a turbine blade.

12. A method of analyzing layer thickness of a multilayer component with an automated system comprising a manipulator and a processor, the method comprising:

receiving at the manipulator of the automated system the multilayer component;

creating an opening with an opening forming device coupled to the manipulator, the opening having a predefined geometry partially into the multilayer component at a selected location on a surface of the multilayer component, wherein the multilayer component comprises a plurality of material layers including at least a substrate and a bond coat, and wherein the opening exposes each of the plurality of material layers;

creating with an imaging device coupled to the manipulator an image of the exposed plurality of material layers in the opening;

calculating with the processor of the automated system at least a thickness of the bond coat of the exposed plurality of material layers from the image and based on the predefined geometry of the opening, wherein the plurality of material layers further includes a depletion layer extending over the bond coat, and wherein the method further comprises determining a thickness of the depletion layer; and

determining a life expectancy of the bond coat based on the at least one of the thickness of the depletion layer and the thickness of the bond coat .

13. A method of repairing a multilayer component with an automated system comprising a manipulator and a processor, the method comprising:

receiving at the manipulator of the automated system the multilayer component;

creating an opening with an opening forming device coupled to the manipulator, the opening having a predefined geometry partially into the multilayer component at a selected location on a surface of the multilayer component, wherein the multilayer component comprises a plurality of material layers including at least a substrate and a bond coat, and wherein the opening exposes each of the plurality of material layers;

creating with an imaging device coupled to the manipulator an image of the exposed plurality of material layers in the opening;

calculating with the processor of the automated system at least a thickness of the bond coat of the exposed plurality of material layers from the image and based on the predefined geometry of the opening, wherein the plurality of material layers further includes a depletion layer extending over the bond coat, and wherein the method further comprises determining a thickness of the depletion layer;

determining a life expectancy of the bond coat based on the at least one of the thickness of the depletion layer and the thickness of the bond coat; and

repairing with the repairing device coupled to the manipulator of the automated system the opening.

14. The method of claim 13, wherein prior to the creating an opening, the multilayer component further includes a thermal barrier coating (TBC) layer extending over the oxide layer, wherein the method further comprises removing the TBC layer prior to the creating an opening, and wherein the repairing includes repairing the TBC layer.