CLAIMS

1. A method of non-destructive detection of surface and near surface abnormalities in a metallic product, the method comprising:

positioning a sample having a surface under a source of an incident radiation; irradiating the surface with the incident radiation from the source;

detecting a scattered radiation;

producing a radiation pattern from the detected scattered radiation;

analysing the radiation pattern;

producing an output indicative of the scattered radiation from the sample;

comparing the output with a threshold value, the threshold value indicative of a maximum acceptable detected surface abnormality; and

identifying the presence of a surface abnormality when the output exceeds the threshold value,

wherein said surface abnormality is one or more of a white layer, white etching layer, amorphous layer, and/or thermo-mechanically deformed region; and

wherein said incident radiation includes at least one of X-ray radiation and/or neutron radiation.

2. The method of claim 1, wherein the threshold value is derived from one or more reference samples with no surface abnormality present.

3. The method of claim 1, wherein said surface abnormality is induced by machining, friction, shaping or forming.

4. The method of any of claims 1 to 3, wherein the output is an intensity value corresponding to an intensity of the detected scattered radiation.

5. The method of any preceding claim, wherein the output is derived from the intensity ratio of one or more scattered radiation peaks.

6. The method of any of claims 2 to 5 wherein the threshold value is derived from the intensity of one or more scattered radiation peaks of the one or more reference samples with no surface abnormality present.

7. The method of claim 6, wherein the threshold value is derived from the intensity ratio of one or more scattered radiation peaks.

8. The method of any of claims 1 to 7, wherein the output is derived from a width of a scattered radiation peak corresponding to the scattered radiation.

9. The method of any of claims 1 to 8 wherein the threshold value is derived from one or more widths of the one or more scattered radiation peaks of the one or more reference samples with no surface abnormality present.

10. The method of claims 1 to 9 wherein the output is obtained by using filtered monochromatic X-rays.

11. The method of claim 10 wherein the output is obtained by scanning with a detector through a range of angles.

12. The method of claim 10 wherein the output is obtained by arranging the detector at a fixed angle.

13. The method of claim 11 wherein the range of angles is 2Θ, wherein Θ is an angle of incidence.

14. The method of any of claims 10 to 13 wherein the source of monochromatic X-ray is any one of copper, iron, molybdenum, chromium, manganese, silver or cobalt.

15. The method of claims 1 to 9 wherein the output is obtained using polychromatic X-rays.

16. The method of claim 1, wherein said sample comprises any alloy of elements from the list: titanium, nickel, iron, aluminium.