CLAIMS

What is claimed is:

1. An apparatus, comprising:

a photon emitter configured to emit photons onto a surface of an article~~,~~;

a photon detector array comprising a plurality of photon detectors ~~configured~~ oriented to receive ~~photons~~ scattered photons from features in the surface of the article~~,~~;

wherein the photon emitter is a flash lamp configured to minimize vibrations while the photon detector array receives the scattered photons from the features in the surface of the article; and

a mapping means for mapping the features in the surface of the article,

wherein the apparatus is configured to characterize the features in the surface of the article by analyzing the scattered photons received at the plurality of photon detectors.

2. The apparatus of ~~any one of C~~claim~~s~~ 1 ~~and 3-7~~,

wherein the apparatus is configured to hold the article in a stationary position without rotation while emitting photons onto the surface of the article.

3. The apparatus of ~~Claim~~ claim 1, further comprising

a telecentric lens,

wherein the telecentric lens is coupled to the photon detector array.

4. The apparatus of ~~Claim~~ claim 1,

wherein the apparatus is operable to process articles at a rate faster than one article per 10 seconds.

5. The apparatus ~~Claim~~ claim 1,

wherein the apparatus is operable to map features smaller than 80 nm in their smallest dimension.

~~6. The apparatus of Claim 1,~~

~~wherein the apparatus is operable to map features greater than 0.10 nm in their smallest dimension.~~

~~7~~6. The apparatus of ~~Claim~~ claim 1,

wherein the mapping means is operable to map features with at least a 10-µm accuracy with respect to location.

~~8~~7. An apparatus, comprising:

a photon emitter configured to emit photons onto a surface of an article;

a telecentric lens;

a photon detector array comprising a plurality of photon detectors coupled to the lens, oriented ~~configured~~ to receive ~~photons~~ scattered photons from one or more features in the surface of the article,

wherein the photon emitter is a flash lamp configured to minimize vibrations while the photon detector array receives the scattered photons from the one or more features in the surface of the article; and

a mapping means for mapping the one or more features in the surface of the article from the scattered photons,

wherein the apparatus is operable to map features smaller than 80 nm in their smallest dimension.

~~9~~8. The apparatus of ~~any one of Claims 8 and 10-14~~claim 7,

wherein the apparatus is configured to hold the article in a stationary position while emitting photons onto the surface of the article.

~~10. The apparatus of Claim 8,~~

~~wherein the apparatus is operable to process articles at a rate faster than one article every 100 seconds.~~

~~11~~9. The apparatus of ~~Claim~~ claim ~~8~~7,

wherein the apparatus is operable to process articles at a rate faster than one article per second.

~~12~~10. The apparatus of ~~Claim~~ claim ~~8~~7,

wherein the apparatus is operable to map features smaller than 25 nm in their smallest dimension.

~~13. The apparatus of Claim 8,~~

~~wherein the apparatus is operable to map features greater than 0.10 nm in their smallest dimension.~~

~~14~~11. The apparatus of ~~Claim~~ claim ~~8~~7,

wherein the mapping means is operable to map features with at least a 10-µm accuracy with respect to location.

~~15~~12. An apparatus, comprising:

a photon emitting means for emitting photons onto a surface of an article~~,~~;

a photon detecting means for detecting ~~photons~~ scattered photons from features in the surface of the article~~,~~

wherein the photon emitting means is a flash lamp configured to minimize vibrations while the photon detecting means receives the scattered photons from the features in the surface of the article; and

a mapping means for mapping the features in the surface of the article from the scattered photons,

wherein the apparatus is operable to process articles at a rate faster than one article every 100 seconds.

~~16~~13. The apparatus of ~~any one of Claims~~ claim 12~~15 and 17-20~~,

wherein the apparatus is configured to hold the article in a stationary position while emitting photons onto the surface of the article.

~~17. The apparatus of Claim 15, wherein the article is greater than 500 square micrometers.~~

~~18~~14. The apparatus of Claim ~~15~~12,

wherein the apparatus is operable to process articles at a rate faster than five article per second.

~~19~~15. The apparatus of Claim ~~15~~12,

wherein the apparatus is operable to map features smaller than 80 nm in their smallest dimension.

~~20~~16. The apparatus of Claim ~~15~~12,

wherein the mapping means is further for analyzing scattering intensity distribution of ~~photons~~ the scattered photons from the features in the surface of the article.

~~21~~17. A device, comprising:

a photon emitter configured to emit photons upon a surface of an article,

wherein the photon emitter is a flash lamp configured to minimize vibrations while a photon detector array receives scattered photons from features about the surface of the article; and

a feature mapper configured to map the features about ~~a~~ the surface of ~~an~~ the article from signals provided by ~~a~~ the photon detector array,

~~wherein the signals correspond to photons scattered from the features about the surface of the article, and~~

wherein the feature mapper is configured for characterizing the features about the surface of the article by analyzing the ~~scattered~~ photons received at the photon detector array.

~~22~~18. The device of Claim ~~21~~17,

wherein the feature mapper is configured for qualitatively characterizing the features about the surface of the article, quantitatively characterizing the features about the surface of the article, ~~and/~~or qualitatively and quantitatively characterizing the features about the surface of the article.

~~23~~19. The device of Claim ~~22~~18,

wherein quantitatively characterizing the features about the surface of the article comprises determining the size of features about the surface of the article, the number of features about the surface of the article, ~~and/~~or the size and number of features about the surface of the article.

~~24~~20. The device of ~~any one of Claims 21-23 and 25~~ claim 17,
wherein the device is operable to map features smaller than 80 nm in their smallest dimension.

~~25. The device of Claim 21, wherein the device is operable to process articles at a rate faster than one article every 100 seconds.~~

21. The apparatus of Claim 2,
wherein the photon emitter is further configured to emit photons uniformly over the entire surface of the article.

22. The apparatus of Claim 8,
wherein the photon emitter is further configured to emit photons uniformly over the entire surface of the article.

23. The apparatus of Claim 22,
wherein the flash lamp is a high-speed flash lamp.

24. The apparatus of Claim 16,
wherein analyzing the scattering intensity distributions of the scattered photons from the features in the surface of the article includes determining sizes of the features in the surface of the article.