What is claimed is:

1. A processor-implemented system for determining coating thicknesses, the system comprising:

one or more processors configured to:

acquire original image data from a coating material applied to a substrate surface;

enhance a color differentiation in the original image data to generate enhanced image data;

acquire spectral response data associated with one or more light sources based at least in part on the enhanced image data;

acquire coating thickness data of the coating material; and

determine a formula associated with an interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; wherein the formula is determined using a linear regression method based at least in part on the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; and

calculate a data structure for the interrelationship using the formula;

one or more non-transitory machine-readable storage media for storing the original image data, the enhanced image data, the spectral response data, the coating thickness data, and a data structure for the interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material.

2. The system of claim **1**, wherein the one or more processors are further configured to apply one or more image processing filters to generate the enhanced image data.

3. The system of claim **2**, wherein: the original image data includes a first pixel and a second pixel; the enhanced image data includes a third pixel corresponding to the first pixel and a fourth pixel corresponding to the second pixel; the first pixel is associated with a first color value represented in a color space; the second pixel is associated with a second color value represented in the color space; the third pixel is associated with a third color value represented in the color space; the fourth pixel is associated with a fourth color value represented in the color space; a difference between the first color value and the second color value is smaller than a

threshold; and a difference between the third color value and the fourth color value is larger than the threshold.

4. The system of claim **3**, wherein the color space is defined by a plurality of cylindrical coordinates.

5. The system of claim **3**, wherein the color space corresponds to the hue-saturation-lightness color space, the hue-saturation-value color space, or the hue-saturation-intensity color space.

6. The system of claim **5**, wherein: the first color value corresponds to a first hue value in the color space; the second color value corresponds to a second hue value in the color space; the third color value corresponds to a third hue value in the color space; and the fourth color value corresponds to a fourth hue value in the color space.

7. The system of claim **6**, wherein the threshold is equal to 30 degrees.

8. The system of claim **3**, wherein the color space is defined by a plurality of orthogonal coordinates.

9. The system of claim **3**, wherein the color space corresponds to the red-green-blue color space or the cyan-magenta-yellow-key color space.

10. The system of claim **3**, wherein: the first color value corresponds to a first point in the color space; the second color value corresponds to a second point in the color space; the third color value corresponds to a third point in the color space; the fourth color value corresponds to a fourth point in the color space; the difference between the first color value and the second color value corresponds to a first distance between the first point and the second point; and the difference between the third color value and the fourth color value corresponds to a second distance between the third point and the fourth point.

11. The system of claim **1**, wherein the one or more processors are further configured to: determine a formula associated with the interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; and calculate the data structure for the interrelationship using the formula.

12. The system of claim **11**, wherein the formula indicates that a coating thickness is a function of a spectral response, given the substrate surface and the one or more light sources.

13. The system of claim **1**, wherein the one or more processors are further configured to: perform a spectral response measurement to acquire the spectral response data; perform a thickness measurement to acquire the coating thickness data; and generate the data structure for the interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; wherein the data structure includes one or more spectral response fields for storing the spectral response data and one or more coating thickness fields for storing the coating thickness data, the spectral response data being mapped to the coating thickness data in the data structure.

14. The system of claim **13**, wherein the one or more processors are further configured to: acquire test image data from the coating material applied to a test surface; enhance a color differentiation in the test image data to generate enhanced test image data; determine test spectral response data based at least in part on the enhanced test image data; process a database query that operates over the spectral response fields and the coating thickness fields based at least in part on the test spectral response data; and output a test thickness of the coating material according to the database query.

15. The system of claim **1**, wherein the one or more processors are configured to acquire the original image data in real-time.

16. The system of claim **1**, wherein the one or more processors are configured to perform one or more image processing operations to generate the enhanced image data in real-time; wherein the enhanced image data is used with coatings-related metadata for alerting and notification operations associated with out-of-tolerance conditions.

17. The system of claim **16**, wherein the one or more image processing operations include one or more of color mapping, contrast manipulation, histogram equalization, brightness control, masking using spatial convolution kernels, filtering, compression, thresholding, convolution, correlation, segmentation, multi-spectral band ratioing intensity-hue-saturation (IHS) transformation, spatial convolution filtering, directional filtering, image subtraction, image magnification, layering, focusing, de-focusing, mirroring, and spatial alignment.

18. The system of claim **1**, wherein the one or more processors are further configured to display the enhanced image data.

19. The system of claim **1**, wherein the one or more processors are further configured to scan a code to identify the coating material and select one or more predetermined image processing operations and one or more predetermined parameters associated with the coating material for generating the enhanced image data.

20. The system of claim **19**, wherein the one or more predetermined parameters associated with the coating material include one or more calibration factors.

21. The system of claim **1**, wherein the one or more processors are further configured to perform a calibration process to correlate one or more substrate surfaces, one or more coating materials, or one or more light sources to a standard.

22. The system of claim **1**, wherein the one or more processors are further configured to: image the substrate surface to be coated to acquire substrate imaging data; enhance a color differentiation in the substrate imaging data to generate enhanced substrate imaging data; and process the enhanced substrate imaging data to quantify a level of contamination on the substrate surface.

23. The system of claim **22**, wherein the one or more processors are further configured to display a visual representation of the level of contamination.

24. The system of claim **22**, wherein the one or more processors are further configured to display a visual representation of the enhanced substrate imaging data.

25. The system of claim **22**, wherein the one or more processors are further configured to process the enhanced substrate imaging data to identify one or more types of contamination on the substrate surface.

26. The system of claim **22**, wherein the one or more processors are further configured to select inspection presets associated with a particular type of contaminant before the substrate surface is imaged.

27. The system of claim **22**, wherein the one or more processors are further configured to process the substrate imaging data to calculate an area of the substrate surface to be coated.

28. The system of claim **1**, wherein the one or more processors are further configured to: image an object which includes the substrate surface to be coated to acquire substrate imaging data; segment a plurality of original surfaces of the object from each other in the substrate imaging data, the original surfaces including the substrate surface; apply one or more colors to the original surfaces in the substrate imaging data to generate enhanced substrate imaging data; and display a visual representation of the enhanced substrate imaging data.

29. The system of claim **28**, wherein the one or more colors are stored in the one or more non-transitory machine-readable storage media.

30. The system of claim **28**, wherein the one or more processors are further configured to adjust one or more of filters, masks, and layers that get applied to the substrate imaging data to hone in on a particular color that is acceptable to a user.

31. The system of claim **30**, wherein the one or more processors are further configured to perform real-time adjustment of the one or more of filters, masks, and layers based at least in part on the one or more light sources.

32. The system of claim **28**, wherein the one or more processors are further configured to select and apply a gloss type to the substrate imaging data.

33. The system of claim **28**, wherein the one or more processors are further configured to process the substrate imaging data to calculate an area of the original surfaces of the object to be painted.

34. The system of claim **1**, wherein the one or more processors are further configured to: image the substrate surface to be coated to acquire substrate imaging data; enhance a color differentiation in the substrate imaging data to generate enhanced substrate imaging data; and process the enhanced substrate imaging data to determine whether one or more surface preparation operations are to be performed on the substrate surface.

35. A processor-implemented method for determining coating thicknesses, the method comprising:

acquiring original image data from a coating material applied to a substrate surface;

enhancing, using one or more processors, a color differentiation in the original image data to generate enhanced image data;

acquiring spectral response data associated with one or more light sources based at least in part on the enhanced image data;

acquiring coating thickness data of the coating material;

determining, using the one or more processors, a formula associated with an interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material, wherein the formula is determined using a linear regression method based at least in part on the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; and

calculating a data structure for the interrelationship using the formula, data related to the interrelationship being stored in a data structure in a non-transitory machine-readable storage medium.

36. The method of claim **35**, further comprising: applying one or more image processing filters to generate the enhanced image data.

37. The method of claim **36**, wherein: the original image data includes a first pixel and a second pixel; the enhanced image data includes a third pixel corresponding to the first pixel and a fourth pixel corresponding to the second pixel; the first pixel is associated with a first color value represented in a color space; the second pixel is associated with a second color value represented in the color space; the third pixel is associated with a third color value represented in the color space; the fourth pixel is associated with a fourth color value represented in the color space; a difference between the first color value and the second color value is smaller than a threshold; and a difference between the third color value and the fourth color value is larger than the threshold.

38. The method of claim **37**, wherein the color space is defined by a plurality of cylindrical coordinates.

39. The method of claim **37**, wherein the color space corresponds to the hue-saturation-lightness color space, the hue-saturation-value color space, or the hue-saturation-intensity color space.

40. The method of claim **39**, wherein: the first color value corresponds to a first hue value in the color space; the second color value corresponds to a second hue value in the color space; the third color value corresponds to a third hue value in the color space; and the fourth color value corresponds to a fourth hue value in the color space.

41. The method of claim **40**, wherein the threshold is equal to 30 degrees.

42. The method of claim **37**, wherein the color space is defined by a plurality of orthogonal coordinates.

43. The method of claim **37**, wherein the color space corresponds to the red-green-blue color space or the cyan-magenta-yellow-key color space.

44. The method of claim **37**, wherein: the first color value corresponds to a first point in the color space; the second color value corresponds to a second point in the color space; the third color value corresponds to a third point in the color space; the fourth color value corresponds to a fourth point in the color space; the difference between the first color value and the second color value corresponds to a first distance between the first point and the second point; and the difference between the third color value and the fourth color value corresponds to a second distance between the third point and the fourth point.

45. The method of claim **35**, further comprising: determining a formula associated with the interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; and calculating the data structure for the interrelationship using the formula.

46. The method of claim **35**, wherein the formula indicates that a coating thickness is a function of a spectral response, given the substrate surface and the one or more light sources.

47. The method of claim **35**, further comprising: performing a spectral response measurement to acquire the spectral response data; performing a thickness measurement to acquire the coating thickness data; and generating the data structure for the interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; wherein the data structure includes one or more spectral response fields for storing the spectral response data and one or more coating thickness fields for storing the coating thickness data, the spectral response data being mapped to the coating thickness data in the data structure.

48. The method of claim **47**, further comprising: acquiring test image data from the coating material applied to a test surface; enhancing a color differentiation in the test image data to generate enhanced test image data; determining test spectral response data based at least in part on the enhanced test image data; processing a database query that operates over the spectral response fields and the coating thickness fields based at least in part on the test spectral response data; and outputting a test thickness of the coating material according to the database query.

49. The method of claim **35**, wherein the original image data is acquired in real-time.

50. The method of claim **35**, further comprising: performing one or more image processing operations to generate the enhanced image data in real-time.

51. The method of claim **50**, wherein the one or more image processing operations include one or more of color mapping, contrast manipulation, histogram equalization, brightness control, masking using spatial convolution kernels, filtering, compression, thresholding, convolution, correlation, segmentation, multi-spectral band ratioing, intensity-hue-saturation (IHS) transformation, spatial convolution filtering, directional filtering, image subtraction, image magnification, layering, focusing, de-focusing, mirroring, and spatial alignment.

52. The method of claim **35**, further comprising: displaying the enhanced image data.

53. The method of claim **35**, further comprising: scanning a code to identify the coating material; and selecting one or more predetermined image processing operations and one or more predetermined parameters associated with the coating material for generating the enhanced image data.

54. The method of claim **53**, wherein the one or more predetermined parameters associated with the coating material include one or more calibration factors.

55. The method of claim **35**, further comprising: performing a calibration process to correlate one or more substrate surfaces, one or more coating materials, or one or more light sources to a standard.

56. The method of claim **35**, further comprising: imaging the substrate surface to be coated to acquire substrate imaging data; enhancing a color differentiation in the substrate imaging data to generate enhanced substrate imaging data; and processing the enhanced substrate imaging data to quantify a level of contamination on the substrate surface.

57. The method of claim **56**, further comprising: displaying a visual representation of the level of contamination.

58. The method of claim **56**, further comprising: displaying a visual representation of the enhanced substrate imaging data.

59. The method of claim **56**, further comprising: processing the enhanced substrate imaging data to identify one or more types of contamination on the substrate surface.

60. The method of claim **56**, further comprising: selecting inspection presets associated with a particular type of contaminant before the substrate surface is imaged.

61. The method of claim **56**, further comprising: processing the substrate imaging data to calculate an area of the substrate surface to be coated.

62. The method of claim **35**, further comprising: imaging an object which includes the substrate surface to be coated to acquire substrate imaging data; segmenting a plurality of original surfaces of the object from each other in the substrate imaging data, the original surfaces including the substrate surface; applying one or more colors to the original surfaces in the substrate imaging data to generate enhanced substrate imaging data; and displaying a visual representation of the enhanced substrate imaging data.

63. The method of claim **62**, wherein the one or more colors are stored in the non-transitory machine-readable storage medium.

64. The method of claim **62**, further comprising: adjusting one or more of filters, masks, and layers that get applied to the substrate imaging data to hone in on a particular color that is acceptable to a user.

65. The method of claim **64**, further comprising: performing real-time adjustment of the one or more of filters, masks, and layers based at least in part on the one or more light sources.

66. The method of claim **62**, further comprising: selecting and applying a gloss type to the substrate imaging data.

67. The method of claim **62**, further comprising: processing the substrate imaging data to calculate an area of the original surfaces of the object to be painted.

68. The method of claim **35**, further comprising: imaging the substrate surface to be coated to acquire substrate imaging data; enhancing a color differentiation in the substrate imaging data to generate enhanced substrate imaging data; and processing the enhanced substrate imaging data to determine whether one or more surface preparation operations are to be performed on the substrate surface.

69. A non-transitory computer-readable medium encoded with instructions for commanding one or more processors to execute operations of a method for determining coating thicknesses, the method comprising:

acquiring original image data from a coating material applied to a substrate surface;

enhancing a color differentiation in the original image data to generate enhanced image data; wherein the color differentiation is enhanced by adjusting one or more characteristics of select pixels in the original image data;

acquiring spectral response data associated with one or more light sources based at least in part on the enhanced image data;

acquiring coating thickness data of the coating material; and

determining a formula associated with an interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; wherein the formula is determined using a linear regression method based at least in part on the spectral response data associated with the one or more light sources and the coating thickness data of the coating material; and

calculating a data structure for the interrelationship using the formula;

storing the original image data, the enhanced image data, the spectral response data, the coating thickness data, and a data structure for the interrelationship between the spectral response data associated with the one or more light sources and the coating thickness data of the coating material.

70. The system of claim **1**, wherein the one or more characteristics include one or more of intensity values and color values for the select pixels in the original image data.

71. The processor-implemented method of claim **35**, wherein the one or more characteristics include one or more of intensity values and color values for the select pixels in the original, image data.

72. The non-transitory computer-readable medium of claim **69**, wherein the one or more characteristics include one or more of intensity values and color values for the select pixels in the original image data.