

Claims

- [Claim 1] A system comprising:
- a) a phase solidified substrate comprising a metal substrate and a coagulated plasmon metal complex with a first antigen or a first antibody immobilized on the coagulated plasmon metal complex;
 - b) a fluorescence labeling unit comprised of a labeling fluorescence material configured to label a target to form a labeled target;
 - c) a fluorescence imaging unit configured to make a fluorescence image of the labeled target by irradiating an exciting light thereto and observing an excited fluorescence image by a microscope; and
 - d) a counting unit to count fluorescence points and quantify the target;
- wherein the system is configured to detect the target in an analyte by a fluorescence counting.
- [Claim 2] The system of claim 1, wherein the phase solidified substrate is configured to be formed by a phase solidifying unit, wherein the phase solidifying unit comprises a buffer solution of the first antigen or the first antibody and a plasmonic metal complex solution, wherein the buffer solution has a pH of about 7 or more, and wherein the metal substrate has an electrode potential more than that of the plasmonic metal complex solution.
- [Claim 3] The system of claim 1, wherein the metal substrate comprises a metal powder.
- [Claim 4] The system of claim 2, wherein the plasmonic metal complex solution is in range of 1000 to 5000 ppm.
- [Claim 5] The system of claim 4, wherein the phase solidifying unit is dropped onto the metal substrate to form the coagulated plasmon metal complex, and a device to blow air to stop agglomeration of coagulated plasmon metal complex on the metal substrate.
- [Claim 6] The system of claim 5, wherein the coagulated plasmon metal complex is substantially free of agglomeration of the coagulated plasmon metal complex with each other.
- [Claim 7] The system of claim 1, wherein the target is configured to form an antigen-antibody reaction with the first antigen or the first antibody immobilized on the coagulated plasmon metal complex.
- [Claim 8] The system of claim 1, wherein the fluorescence labeling unit is dropped on the metal substrate to form the labeled target attached with the coagulated plasmon metal complex.

- [Claim 9] The system of claim 8, wherein the fluorescence imaging unit comprises a light source to irradiate the excitation light having a wavelength range suitable for fluorescence for the labeled target attached with the coagulated plasmon metal complex.
- [Claim 10] The system of claim 1, wherein the counting unit is configured to binarize the fluorescence image to adopt the fluorescence points and quantitatively count the fluorescence points.
- [Claim 11] The system of claim 1, wherein the fluorescence image is binarized with an analysis condition comprises one or more of a brightness, an area, and a circularity of the fluorescence points in the fluorescence image.
- [Claim 12] The system of claim 11, wherein the analysis condition comprises the brightness and the area in the fluorescence image.
- [Claim 13] The system of claim 1, wherein the target comprises an antigen or an antibody.
- [Claim 14] The system of claim 13, wherein the target is labelled by a sandwich method or a direct method or an indirect method.
- [Claim 15] The system of claim 1, wherein the system is configured to detect more than one type of the target.
- [Claim 16] The system of claim 13, wherein the target comprises a virus comprising influenza and/or COVID-19 virus.
- [Claim 17] The system of claim 15, wherein the system comprises a filter for the labeling fluorescence material having a different wave range depending on the target.
- [Claim 18] A method comprising:
a) coagulating of a plasmon metal complex solution with a buffer solution of a first antigen or a first antibody;
b) forming a phase solidified substrate comprising a metal substrate and a coagulated plasmon metal complex with an immobilized first antigen or an immobilized first antibody;
c) forming an antigen-antibody reaction of a target with the immobilized first antigen or the immobilized first antibody on the coagulated plasmon metal complex;
d) forming a labeled target attached with the coagulated plasmon metal complex, wherein the labeled target comprises the target and a labeling fluorescent material;
e) making a fluorescence image of the labeled target by irradiating an exciting light;

- e) observing the fluorescence image by a microscope;
- f) counting fluorescence points; and
- g) quantifying the target.

- [Claim 19] The method of claim 18, wherein the phase solidified substrate is configured to be formed by a phase solidifying unit, wherein the phase solidifying unit comprises the buffer solution of the first antigen or the first antibody and the plasmonic metal complex solution, wherein the buffer solution has a pH of about 7 or more, wherein the metal substrate has an electrode potential more than that of the plasmonic metal complex solution.
- [Claim 20] The method of claim 18, wherein the metal substrate comprises a metal powder.
- [Claim 21] The method of claim 19, wherein the plasmonic metal complex solution is in range of 1000 to 5000 ppm.
- [Claim 22] The method of claim 21, wherein the phase solidifying unit is dropped onto the metal substrate and coagulating to form coagulated plasmon metal complex with an immobilized first antigen or an immobilized first antibody, and a device to blow air to stop agglomeration of coagulated plasmon metal complex on the metal substrate.
- [Claim 23] The method of claim 22, wherein the coagulated plasmon metal complex is substantially free of agglomeration of the coagulated plasmon metal complex with each other
- [Claim 24] The method of claim 18, wherein a fluorescence labeling unit comprised of the labeling fluorescence material is configured to label the target forming the labeled target, wherein the fluorescence labeling unit is dropped on the metal substrate to form the labeled target attached to the coagulated plasmon metal complex.
- [Claim 25] The method of claim 18, wherein a fluorescence imaging unit is configured to make the fluorescence image, wherein the fluorescence imaging unit comprises a light source for irradiating the excitation light having a wavelength range suitable for fluorescence of a fluorescent substance of the labeled target.
- [Claim 26] The method of claim 18, wherein a fluorescence counting unit is configured to count the fluorescence points.
- [Claim 27] The method of claim 26, wherein the fluorescence counting unit is configured to binarize the fluorescence image to adopt the fluorescence points and quantitatively count the fluorescence points.
- [Claim 28] The method of claim 18, wherein the fluorescence image is binarized

- with an analysis condition comprising one or more of a brightness, an area, and a circularity of the fluorescence points in the fluorescence image.
- [Claim 29] The method of claim 28, wherein the analysis condition comprises the brightness and the area in the fluorescence image.
- [Claim 30] The method of claim 18, wherein the target comprises an antigen or an antibody.
- [Claim 31] The method of claim 18, wherein the method is compatible to detect more than one of type of the target simultaneously.
- [Claim 32] The method of claim 31, wherein the target comprises a virus comprising influenza and/or COVID-19 virus.
- [Claim 33] The method of claim 18, wherein the target is labelled by a sandwich method or a direct method or an indirect method.
- [Claim 34] The method of claim 31, wherein the labeling fluorescence material having a different wave range depending on the target.
- [Claim 35] A method for detecting COVID-19 comprising:
a) coagulating of a plasmon metal complex solution with a buffer solution of a first antigen or a first antibody;
b) forming a phase solidified substrate comprising a metal substrate and a coagulated plasmon metal complex with an immobilized first antigen or an immobilized first antibody;
c) forming an antigen-antibody reaction of a COVID-19 target with the immobilized first antigen or the immobilized first antibody on the coagulated plasmon metal complex;
d) forming a labeled COVID-19 target attached with the coagulated plasmon metal complex, wherein the labeled COVID-19 target comprises the COVID-19 target and a labeling fluorescent material;
d) making a fluorescence image of the labeled COVID-19 target by irradiating an exciting light;
e) observing the fluorescence image by a microscope;
f) counting fluorescence points; and
g) quantifying the COVID-19 target.
- [Claim 36] The method for detecting COVID-19 of claim 35, wherein the phase solidified substrate is configured to be formed by a phase solidifying unit, wherein the phase solidifying unit comprises the buffer solution of the first antigen or the first antibody and the plasmonic metal complex solution, wherein the buffer solution has a pH of about 7 or more, wherein the metal substrate has an electrode potential more than that of

- the plasmonic metal complex solution.
- [Claim 37] The method for detecting COVID-19 of claim 35, wherein the metal substrate comprises a metal powder.
- [Claim 38] The method for detecting COVID-19 of claim 36, wherein the plasmonic metal complex solution is in range of 1000 to 5000 ppm.
- [Claim 39] The method for detecting COVID-19 of claim 38, wherein the phase solidifying unit is dropped onto the metal substrate and coagulating to form coagulated plasmon metal complex with an immobilized first antigen or an immobilized first antibody, and a device to blow air to stop agglomeration of coagulated plasmon metal complex on the metal substrate.
- [Claim 40] The method for detecting COVID-19 of claim 39, wherein the coagulated plasmon metal complex is substantially free of agglomeration of the coagulated plasmon metal complex with each other
- [Claim 41] The method for detecting COVID-19 of claim 35, wherein a fluorescence labeling unit comprised of the labeling fluorescence material is configured to label the COVID-19 target forming the labeled COVID-19 target, wherein the fluorescence labeling unit is dropped on the metal substrate to form the labeled COVID-19 target attached to the coagulated plasmon metal complex.
- [Claim 42] The method for detecting COVID-19 of claim 35, wherein a fluorescence imaging unit is configured to make the fluorescence image, wherein the fluorescence imaging unit comprises a light source for irradiating the excitation light having a wavelength range suitable for fluorescence of a fluorescent substance of the labeled COVID-19 target.
- [Claim 43] The method for detecting COVID-19 of claim 35, wherein a fluorescence counting unit is configured to count the fluorescence points.
- [Claim 44] The method for detecting COVID-19 of claim 43, wherein the fluorescence counting unit is configured to binarize the fluorescence image to adopt the fluorescence points and quantitatively count the fluorescence points.
- [Claim 45] The method for detecting COVID-19 of claim 35, wherein the fluorescence image is binarized with an analysis condition comprising one or more of a brightness, an area, and a circularity of the fluorescence points in the fluorescence image.
- [Claim 46] The method for detecting COVID-19 of claim 45, wherein the analysis condition comprises the brightness and the area in the fluorescence image.

- [Claim 47] The method for detecting COVID-19 of claim 35, wherein the COVID-19 target comprises an antigen or an antibody.
- [Claim 48] The method for detecting COVID-19 of claim 35, wherein the method is compatible to detect a second target with the COVID-19 target.
- [Claim 49] The method for detecting COVID-19 of claim 48, wherein the second target comprises a virus comprising influenza.
- [Claim 50] The method for detecting COVID-19 of claim 48, wherein the COVID-19 target and/or the second target is labelled by a sandwich method or a direct method or an indirect method.
- [Claim 51] The method for detecting COVID-19 of claim 48, wherein the labeling fluorescence material having a different wave range depending on the COVID-19 target and the second target.