

to bind many labeling substances. Specific examples of the polypeptide include albumin (e.g. bovine serum albumin), polylysine, histone H1, myelin basic protein (MBP), and albumen lysozyme. However, the present invention is not limited only thereto.

**[0114]** The polypeptide constituting the polypeptide support **91** may be a polypeptide composed of a multimer in which a plurality of subunits are associated. In this case, the multimer may be a homo-multimer in which each subunit is mutually the same or may be a hetero-multimer in which each subunit is mutually different. Further, the multimer may be a multimer in which each subunit is mutually homologous. Examples of the polypeptide composed of such a multimer include a polypeptide having a homo multimer structure, such as ferritin, streptoavidin or *Listeria Dps*; and a polypeptide produced by using the outer shells of particles of viruses such as HSV (simple herpes virus), Rotavirus, Reovirus, poliovirus, Ross river virus and poliovirus. However, the present invention is not limited only thereto.

**[0115]** Among the polypeptides, ferritin and albumin are preferred from the viewpoint of the easy bulk preparation at low cost. Preferably, ferritin is modified so that a bonding site to which the labeling substance can be bound is located at the outside of a ferritin molecule. As the ferritin modified in such a manner, for example, a variant ferritin in which the 86th serine residue located at the outside of a horse ferritin molecule is modified to a cysteine residue to which the labeling substance by modified with maleimide can be bound (cysteine residue having high reactivity with a maleimide group) is listed.

**[0116]** The first binding substance **92** may be a substance which binds to a position or site in the analyte S, which is different from that of the trapping substance **81**. The first binding substance **92** is suitably selected depending on the type of the analyte S. For example, when the analyte S is a nucleic acid, a nucleic acid probe hybridizing to the nucleic acid, an antibody to the nucleic acid, a protein binding to the nucleic acid or the like can be used as the first binding substance **92**. When the analyte S is a protein or peptide, an antibody to the protein or peptide can be used as the first binding substance **92**.

**[0117]** The labeling substance **93** is a substance which becomes in an excited state when irradiated with light and releases electrons. As the labeling substance **93**, at least one selected from the group consisting of a metal complex, an organic phosphor, a quantum dot, and an inorganic phosphor can be used.

**[0118]** Specific examples of the labeling substance include metal phthalocyanine dyes, a ruthenium complex, an osmium complex, an iron complex, a zinc complex, 9-phenylxanthene-based dyes, cyanine-based dyes, metalocyanine dyes, xanthene-based dyes, triphenylmethane-based dyes, acridine-based dyes, oxazine-based dyes coumarin-based dyes, merocyanine-based dyes, rhodacyanine-based dyes, polymethine-based dyes, porphyrin-based dyes, phthalocyanine-based dyes, rhodamine-based dyes, xanthene-based dyes, chlorophyll-based dyes, eosine-based dyes, mercurochrome-based dyes, indigo-based dyes, BODIPY-based dyes, CALFluor-based dyes, Oregon green-based dyes, Rhodol green, Texas red, Cascade blue, nucleic acids (DNA and RNA), cadmium selenide, cadmium telluride,  $\text{Ln}_2\text{O}_3\cdot\text{Re}$ ,  $\text{Ln}_2\text{O}_2\text{S}\cdot\text{Re}$ ,  $\text{ZnO}$ ,  $\text{CaWO}_4$ ,  $\text{MO}_x\text{Al}_2\text{O}_3\cdot\text{Eu}$ ,  $\text{Zn}_2\text{SiO}_4\cdot\text{Mn}$ ,  $\text{LaPO}_4\cdot\text{Ce}$ ,  $\text{Tb}$ ,  $\text{Cy3}$ ,  $\text{Cy3.5}$ ,  $\text{Cy5}$ ,  $\text{Cy5.5}$ ,  $\text{Cy7}$ ,  $\text{Cy7.5}$ , and  $\text{Cy9}$  (all products are manufactured by Amersham Biosciences

K.K.); Alexa Fluor 355, Alexa Fluor 405, Alexa Fluor 430, Alexa Fluor 488, Alexa Fluor 532, Alexa Fluor 546, Alexa Fluor 555, Alexa Fluor 568, Alexa Fluor 594, Alexa Fluor 633, Alexa Fluor 647, Alexa Fluor 660, Alexa Fluor 680, Alexa Fluor 700, Alexa Fluor 750 and Alexa Fluor 790 (all products are manufactured by Molecular Probes, Inc.); DY-610, DY-615, DY-630, DY-631, DY-633, DY-635, DY-636, EVOblue10, EVOblue30, DY-647, DY-650, DY-651, DY-800, DYQ-660, and DYQ-661 (all products are manufactured by Dyomics); Atto425, Atto465, Atto488, Atto495, Atto520, Atto532, Atto550, Atto565, Atto590, Atto594, Atto610, Atto611X, Atto620, Atto633, Atto635, Atto637, Atto647, Atto655, Atto680, Atto700, Atto725 and Atto740 (all products are manufactured by Atto-TEC GmbH); and VivoTagS680, VivoTag680, and VivoTagS750 (all products are manufactured by VisEn Medical). Ln represents La, Gd, Lu, or Y, Re represents a lanthanide element, M represents an alkali earth metal element, and x represents a number of 0.5 to 1.5. Concerning other examples of the labeling substance, refer to, for example, U.S. Patent Publication No. 2009/294305 and U.S. Pat. No. 5,893,999.

**[0119]** Examples of the first linker **94** include a carbon chain, a polyethylene glycol (PEG) chain, and nucleic acid. Since a suitable range of the length of the linker varies depending on the type of labeling substances or functional groups, it is preferable that the range is suitably set according to the type of labeling substances or functional groups.

**[0120]** The label binding substance **90** may not have the first linker **94** as long as it can directly bind the labeling substance **93** to the polypeptide support **91**.

**[0121]** Examples of the method for binding the labeling substance **93** to the polypeptide support **91** in the label binding substance **90** include a method for binding the labeling substance **93** to the polypeptide support **91** by a covalent bond and a method for binding the labeling substance **93** to the polypeptide support **91** by a non-covalent bond.

**[0122]** The method for binding the labeling substance **93** to the polypeptide support **91** by a covalent bond may be a method capable of covalently binding the labeling substance **93** to a polypeptide and it is not particularly limited.

**[0123]** In the polypeptide support **91**, a site to which the labeling substance **93** is covalently bound is not particularly limited. From the viewpoint that the binding of the polypeptide support **91** to the labeling substance **93** is easy, an amino group ( $\text{NH}_2$ ) in a polypeptide and a sulfhydryl (SH) group are preferred. Examples of a reaction group capable of binding to an amino group ( $\text{NH}_2$ ) in a polypeptide include a succinimido group (NHS), an isothiocyano group (ITC), a chlorosulfonyl group, a chloroacyl group, an oxyethylene group, a chloroalkyl group, an aldehyde group, and a carboxyl group. Among them, NHS and ITC are preferred because when a target labeling substance is covalently bound via an amino group of polypeptide, a reaction in an aqueous system is essential, and the conditions capable of using a reaction compound are limited such that the pH of the reaction solution is in a neutral to weak alkaline region and the reaction is progressed at a reaction temperature of ice-cooling to about  $37^\circ\text{C}$ . for a short time. Therefore, a labeling substance having NHS and/or ITC can be used as the labeling substance **93**.

**[0124]** Examples of the reaction group capable of binding to a sulfhydryl (SH) group in polypeptide include a maleimide group and a bromoacetamide group. The sulfhydryl (SH) group normally forms a disulfide ( $\text{S}-\text{S}$ ) bond in a polypeptide. Thus, when the sulfhydryl (SH) group is used as a site for