between the substrates. The interconnection is produced especially by means of wafer bonding, preferably with a direct bonding method and even more preferably a direct bonding method with plasma activation.

Especially indium-tin-oxide (ITO) is used as the transparent conductive oxides (TCO). The abbreviation ITO will be used below for indium-tin-oxide. ITO is widely used in the production of LCD displays, where it is used as an optically transparent electrical conductor. Alternatively the following materials are used:

- doped zinc oxide, especially aluminum doped zinc oxide (AZO), gallium doped zinc oxide (GZO),
- fluorine [doped] tin oxide (FTO), and
- antimony tin oxide (ATO).

Basically any material which can be oxidized and which especially with appropriate doping has the desired properties, especially electrical conductivity and optical transparency, can be used.

In this connection, as claimed in the invention electrical conductivity is addressed when the material has a conductivity of > 10e1 ~~S/cm^2~~ S/cm, preferably 10e2 ~~S/cm^2~~ S/cm, more preferably 10e3 ~~S/cm^2~~ S/cm (measured with the four point method which is conventional in semiconductor technology, relative to a temperature of 300 K). The optical transmission (transmittance) defined as that percentage of light of a certain wavelength range, which the layer is designed to pass according to the application, should be at least > 80%, advantageously > 87%, preferably > 93% and even more preferably > 96% by a film with a thickness according to the application.

As claimed in the invention wavelength ranges which extend from 300 nm to 1800 nm are preferred for photovoltaic applications. This means that the relevant wavelength range is in any case

Claims

1. A method for bonding of a first contact area (3) of a first at least largely transparent substrate (1) to a second contact area (4) of a second at least largely transparent substrate (2), on at least one of the contact areas (3, 4) an oxide being used for bonding, from which an at least largely transparent interconnection layer (14) is formed with:

- an electrical conductivity of at least $10e^{1}$ ~~S/cm^{2}~~ S/cm (measurement: four point method, relative to temperature of 300K) and
- an optical transmittance greater than 0.8 ~~(~~for a wavelength range from 400 nm to 1500 nm~~)~~ on the first and second contact area (3, 4),

wherein the interconnection layer (14) is formed of a plurality of oxide layers (6, 9, 10, 11) after bonding, and wherein the plurality of oxide layers (6, 9, 10, 11) are interconnected vertically in an electrically conductive manner.

2. A method for producing a first substrate (1) with a first contact area (3) for bonding to a second contact area (4) of a second substrate (2), wherein the upper surface of the first contact area (3) comprises a first oxide layer (6) with:

- an electrical conductivity of at least $10e^{1}$ ~~S/cm^{2}~~ S/cm (measurement: four point method, relative to temperature of 300K) and
- an optical transmittance greater than 0.8 ~~(~~for a wavelength range from 400 nm to 1500 nm~~)~~ being applied to the first substrate (1),

wherein the lower surface of the second contact areas (4) is formed of a plurality of oxide layers (9, 10, 11), and wherein the plurality of oxide layers (6, 9, 10, 11) are interconnected

vertically in an electrically conductive manner.

3. The method as claimed in one of the preceding claims, wherein the first contact area (3) is plasma-activated, especially prior to contact-making.

4. A method for producing a second substrate ~~(1)~~ (2) with a second contact area ~~(3)~~(4) for bonding to a first contact area ~~(4)~~ (3) of a first substrate ~~(2)~~ (1), with the following steps, especially the following sequence:

- application of a second oxide layer (11) to the second substrate (2),
- application of a third oxide layer (10) to the second oxide layer (11), the third oxide layer (10) having an oxygen volume S_I which is smaller than 70% of the maximum oxygen volume S_{max} of the third oxide layer (10) and
- application of a fourth oxide layer (9) to the third oxide layer (10),

wherein the upper surface of the first contact area (3) comprises a first oxide layer (6), and wherein the plurality of oxide layers (6, 9, 10, 11) are interconnected vertically in an electrically conductive manner.

5. The method as claimed in one of the preceding claims, wherein the oxide or one or more of the oxide layers (6, 9, 10, 11) contain at least one of the following components, especially as doping:

- indium,
- tin,

- aluminum,
- zinc,
- gallium,
- fluorine or
- antimony.

6. The method as claimed in one of the preceding claims, wherein the oxide or one or more of the oxide layers (6, 9, 10, 11) are applied by one of the following methods:

- metal organic chemical vapor deposition,
- metal organic molecular beam deposition,
- spray pyrolysis,
- pulsed laser deposition or
- sputtering.