WHAT IS CLAIMED IS:

1. A display device, comprising:

a first display panel, comprising a first substrate, a second substrate and a first display medium layer disposed between the second substrate and the first substrate;

a second display panel, comprising a third substrate, a fourth substrate and a second display medium layer disposed between the third substrate and the fourth substrate, the first display panel and the second display panel being mutually stacked in a manner that the second substrate and the fourth substrate are located between the first substrate and the third substrate;

a quantum dot layer, disposed between the second substrate and the fourth substrate, the quantum dot layer comprising multiple first quantum dot particles, multiple second quantum dot particles and multiple diffusing particles dispersed therein;

a first adhesive layer, disposed around the quantum dot layer and adhering the quantum dot layer to the first display panel, wherein an air gap is formed between the first display panel and the quantum dot layer; and

a backlight module, located at a side of the second display panel.

2. The display device according to claim 1, wherein the first display panel further comprises a first polarization layer and a second polarization layer, the second display panel further comprises a third polarization layer and a fourth polarization layer, the first display medium layer is located between the first polarization layer and the second polarization layer, the second display medium layer is located between the third polarization layer and the fourth polarization layer, the quantum dot layer is located between the second polarization layer and the fourth polarization layer, and both the first display panel and the second display panel are located between the first polarization layer and the third polarization layer.

3. The display device according to claim 2, wherein the second polarization layer is disposed between the second substrate and the quantum dot layer.

4. The display device according to claim 2, wherein the fourth polarization layer is

disposed between the fourth substrate and the quantum dot layer.

5. The display device according to claim 2, wherein the fourth polarization layer is disposed between the fourth substrate and the second display medium layer.

6. The display device according to claim 5, wherein the fourth substrate is disposed between the fourth polarization layer and the quantum dot layer, and the quantum dot layer contacts with the fourth substrate.

7. The display device according to claim 1, further comprising a second adhesive layer that adheres the quantum dot layer to the second display panel.

8. The display device according to claim 1, wherein the backlight module is used for emitting initial light towards the second display panel, the initial light is converted to have a first wavelength range after passing through the first quantum dot particles and is converted to have a second wavelength range after passing through the second quantum dot particles, the initial light has a third wavelength range, and a third part of the initial light still has the third wavelength range after passing through the diffusing particles, the first wavelength range, the second wavelength range and the third wavelength range being different from one another.

9. The display device according to claim 1, wherein the first display panel further comprises a first pixel array layer disposed between the second substrate and the first display medium layer, and the second display panel further comprises a second pixel array layer disposed between the third substrate and the second display medium layer.

10. The display device according to claim 9, wherein a first pixel disposing density of the first pixel array layer is different from a second pixel disposing density of the second pixel array layer.

11. The display device according to claim 9, wherein the quantum dot layer comprises multiple first quantum dot pixels, multiple second quantum dot pixels and multiple third quantum dot pixels, the first pixel array layer comprises multiple first pixel electrodes, and each of the first quantum dot pixels, the second quantum dot pixels and the third quantum dot

pixels corresponds to one of the first pixel electrodes.

12. The display device according to claim 11, wherein all the first quantum dot particles are distributed in the first quantum dot pixels, all the second quantum dot particles are distributed in the second quantum dot pixels, and the diffusing particles are distributed in the first quantum dot pixels, the second quantum dot pixels and the third quantum dot pixels.

13. The display device according to claim 11, wherein the quantum dot layer further comprises multiple spacing members, and the spacing members are disposed between every adjacent two of the first quantum dot pixels, the second quantum dot pixels and the third quantum dot pixels respectively.

14. The display device according to claim 1, wherein the first display panel further comprises a color filter layer, and the color filter layer is disposed between the first substrate and the first display medium layer or disposed between the second substrate and the first display medium layer.

15. A display device, comprising:

a first substrate;

a second substrate, opposite to the first substrate;

a first display medium layer, disposed between the first substrate and the second substrate;

a third substrate, the second substrate being located between the first substrate and the third substrate;

a second display medium layer, disposed between the second substrate and the third substrate;

a quantum dot layer, located between the first display medium layer and the second display medium layer, the quantum dot layer comprising multiple first quantum dot pixels, multiple second quantum dot pixels and multiple third quantum dot pixels, each of the first quantum dot pixels comprising multiple first quantum dot particles, each of the second quantum

dot pixels comprising multiple second quantum dot particles, and each of the first quantum dot pixels, the second quantum dot pixels and the third quantum dot pixels comprising multiple diffusing particles;

wherein the quantum dot layer further comprises multiple spacing members disposed between every adjacent two of the first quantum dot pixels, the second quantum dot pixels and the third quantum dot pixels respectively, and a distance between adjacent two of spacing members decreases from the second display panel to the first display panel; and

a backlight module, disposed at a side of the third substrate.

16. The display device according to claim 15, further comprising a first pixel array layer, wherein the first pixel array layer is disposed between the second substrate and the first display medium layer, the first pixel array layer comprises multiple first pixel electrodes, and each of the first quantum dot pixels, the second quantum dot pixels and the third quantum dot pixels corresponds to one of the first pixel electrodes.

17. The display device according to claim 16, further comprising a second pixel array layer, wherein the second pixel array layer is disposed between the third substrate and the second display medium layer, the second pixel array layer comprises multiple second pixel electrodes, and each of the first quantum dot pixels, the second quantum dot pixels and the third quantum dot pixels corresponds to one of the second pixel electrodes.

18. The display device according to claim 15, further comprising a fourth substrate, the fourth substrate being located between the second display medium layer and the quantum dot layer.