WHAT IS CLAIMED IS:

1. A neodymium-iron-boron magnet, characterized by comprising a main phase crystal grain, a shell layer of the main phase crystal grain and a Nd-rich phase adjacent to the main phase crystal grain, wherein

the main phase crystal grain comprises $Nd_2Fe_{14}B$; or the main phase crystal grain comprises $Nd_2Fe_{14}B$ and $Pr_2Fe_{14}B$;

the shell layer comprises $(Nd/Dy)_2Fe_{14}B$ and/or $(Nd/Tb)_2Fe_{14}B$;

the shell layer has a thickness of 0.1-6 μm;

the Nd-rich phase comprises a $R_6Fe_{13}B$ phase, wherein the R is one or more selected from the group consisting of Nd, Pr, Dy and Tb.

2. The neodymium-iron-boron magnet according to claim 1, characterized in that:

the shell layer has a thickness of 0.1-5 μm, preferably 0.1-5 μm, more preferably 0.1-4 μm; and/or

the shell layer accounts for 30%-60% by volume, preferably 45-56% by volume, such as 45.7% by volume, 50.3% by volume, 50.78% by volume or 52.7% by volume of the neodymium-iron-boron magnet; and/or

the Nd-rich phase further comprises ZrB_2 and/or TiB_2; and/or

the Nd-rich phase further comprises a first grain boundary phase comprising Fe, T and B, wherein T is Zr and/or Ti; and/or

the Nd-rich phase further comprises a second grain boundary phase comprising Nd, Ga, Al, Fe and Dy.

3. A preparation method of the neodymium-iron-boron magnet according to claim 1or 2, characterized by comprising the steps of:

S1: preparing a main alloy sheet and an auxiliary alloy sheet respectively;

wherein, the raw material for the main alloy sheet comprises LH_1, RH_1, X_1, Y_1, Fe and B; the LH_1 is Nd or a PrNd alloy; the RH_1 is Dy and/or Gd; the X_1 is one or more selected from the group consisting of Ti, Zr and Nb; and the Y_1 is one or more selected from the group consisting of Al, Cu, Ga and Co;

in the raw material for the main alloy sheet, the LH_1 accounts for 25-27.5% by mass of the main alloy sheet, the RH_1 accounts for 3-5% by mass of the main alloy sheet, the X_1 accounts for 0.05-0.6% by mass of the main alloy sheet, and the Y1 accounts for 0.05-3.5% by mass of the main alloy sheet, wherein the sum of the mass percentages of respective elements in the main alloy sheet is 100%;

the raw material for the auxiliary alloy sheet comprises RH_2, X_2 and Fe; the RH_2 is Tb and/or Dy, and the X_2 is one or more selected from the group consisting of Ti, Zr and Nb;

in raw material for the auxiliary alloy sheet, the RH_2 accounts for 40-60% by mass of the auxiliary alloy sheet, and the X_2 accounts for 0-8% by mass of the auxiliary alloy sheet, wherein the sum of the mass percentages of respective elements in the auxiliary alloy sheet is 100%;

S2: subjecting a mixture, which is obtained by hydrogen decrepitating or pulverizing the main alloy sheet and the auxiliary alloy sheet, to orientation pressing treatment, isostatic pressing treatment and sintering treatment to achieve the neodymium-iron-boron material, wherein

the mass of the main alloy sheet accounts for 82% or more and less than 100% of the total mass of the main alloy sheet and the auxiliary alloy sheet.

4. The preparation method of the neodymium-iron-boron magnet according to claim 3, characterized in that:

in S1, in the raw material for the main alloy sheet, Pr accounts for 0-34% by mass, excluding 0% by mass; preferably 0-7% by mass, excluding 0% by mass of the PrNd alloy; and/or

in S1, in the raw material for the main alloy sheet, the LH_1 accounts for 25-27% by mass, such as 25.2% by mass or 26.58% by mass of the main alloy sheet; and/or

in S1, in the raw material for the main alloy sheet, the RH_1 accounts for 4% by mass, 4.2% by mass or 4.4% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Dy, the Dy accounts for 4-5% by mass, such as 4% by mass or 4.2% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Gd, the Gd accounts

for 0-1% by mass, such as 0.4% by mass of the main alloy sheet; and/or

in S1, in the raw material for the main alloy sheet, the X_1 accounts for 0.1-0.3% by mass, for example 0.2% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Zr, the Zr accounts for 0-0.5% by mass, excluding 0% by mass; such as 0.1% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Ti, the Ti accounts for 0.05-0.3% by mass, such as 0.2% by mass of the main alloy sheet; and/or

in S1, in the raw material for the main alloy sheet, the Y_1 accounts for 1.5-3.5% by mass, such as 1.96% by mass, 2.09% by mass or 3.1% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Co, the Co accounts for 1-3% by mass, preferably 1-2.5% by mass, such as 1.19% by mass or 2.2% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Cu, the Cu accounts for 0.1-0.5% by mass, preferably 0.2-0.3% by mass, for example 0.21% by mass or 0.3% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Al, the Al accounts for 0.05-0.7% by mass, preferably 0.2-0.45% by mass, such as 0.2% by mass, 0.3% by mass or 0.43% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Ga, the Ga accounts for 0.1-0.4% by mass, preferably 0.25-0.4% by mass, such as 0.26% by mass of the main alloy sheet; and/or

in S1, when the raw material for the main alloy sheet comprises Cu and Ti, the mass ratio of Cu to Ti is (1-1.5) : 1; and/or

in S1, when the raw material for the main alloy sheet comprises Ti, Cu and Al, the total amount of Ti, Cu and Al accounts for 0.05-2% by mass, preferably 0.3-1.25% by mass, more preferably 0.7-0.9% by mass, such as 0.71% by mass or 0.84% by mass of the main alloy sheet; and/or

in S1, in the raw material for the main alloy sheet, the B accounts for 0.88-1.05% by mass, preferably 0.95-1% by mass, for example 0.98% by mass of the main alloy sheet.

5. The preparation method of the neodymium-iron-boron magnet according to claim 4, characterized in that:

the main alloy sheet comprises: Nd with a content of 26.58%; Dy with a content of 4%; Co with a content of 1.19%; Cu with a content of 0.21%; Al with a content of 0.3%; Ga with a content of 0.26%; Ti with a content of 0.2%; B with a content of 1%; Fe with a content of 66.26%, wherein the percentages refer to the mass percentages of the components in the raw material for the main alloy sheet; or

the main alloy sheet comprises: Nd with a content of 26.58%; Dy with a content of 4%; Gd with a content of 0.4%; Co with a content of 2.2%; Cu with a content of 0.21%; Al with a content of 0.43%; Ga with a content of 0.26%; Ti with a content of 0.2%; B with a content of 1%; Fe with a content of 64.72%, wherein the percentages refer to the mass percentages of the components in the raw material for the main alloy sheet; or

the main alloy sheet comprises: Nd with a content of 25.2%; Dy with a content of 4.2%; Co with a content of 1.19%; Cu with a content of 0.3%; Al with a content of 0.2%; Ga with a content of 0.4%; Zr with a content of 0.1%; Ti with a content of 0.2%; B with a content of 0.98%; Fe with a content of 67.23%, wherein the percentages refer to the mass percentages of the components in the raw material for the main alloy sheet; or

the main alloy sheet comprises: the PrNd alloy with a content of 26.58%; Dy with a content of 4%; Co with a content of 1.19%; Cu with a content of 0.21%; Al with a content of 0.3%; Ga with a content of 0.26%; Ti with a content of 0.2%; B with a content of 1%; Fe with a content of 66.26%, wherein the percentages refer to the mass percentages of the components in the raw material for the main alloy sheet; and the mass ratio of Pr to Nd in the PrNd alloy is 25:75.

6. The preparation method of the neodymium-iron-boron magnet according to claim 3, characterized in that:

in S1, in the raw material for the auxiliary alloy sheet, the RH_2 accounts for 55% by mass of the auxiliary alloy sheet; and/or

in S1, when the raw material for the auxiliary alloy sheet comprises Dy, the Dy accounts for 40-75% by mass, such as 55% by mass of the auxiliary alloy sheet; and/or

in S1, when the raw material for the auxiliary alloy sheet comprises Zr, the Zr accounts for 0-8% by mass, such as 7.3% by mass of the auxiliary alloy sheet; and/or

in S1, the raw material for the auxiliary alloy sheet further comprises Nd, and the Nd accounts for 0-15% by mass of the auxiliary alloy sheet; and/or

in S1, the raw material for the auxiliary alloy sheet further comprises B, and the B accounts for 0-1.5% by mass, preferably 0-0.9% by mass, for example 0.4% by mass of the auxiliary alloy sheet.

7. The preparation method of the neodymium-iron-boron magnet according to claim 6, characterized in that:

the auxiliary alloy sheet comprises: Dy with a content of 55%; Zr with a content of 7.3%; and Fe with a content of 37.7%, wherein the percentages refer to the mass percentages of the components in the raw material for the auxiliary alloy sheet; or

the auxiliary alloy sheet comprises: Nd with a content of 15%; Dy with a content of 40%; B with a content of 0.4%; and Fe with a content of 44.6%, wherein the percentages refer to the mass percentages of the components in the raw material for the auxiliary alloy sheet.

8. The preparation method of the neodymium-iron-boron magnet according to claim 3, characterized in that:

in S1, the main alloy sheet is obtained by smelting and casting the raw material for the main alloy sheet; or, the auxiliary alloy sheet is obtained by smelting and casting the raw material for the auxiliary alloy sheet; and/or

in the preparation method of the main alloy sheet, the temperature for smelting raw material for the main alloy sheet is 1500-1550°C; and/or

in the preparation method of the main alloy sheet, the temperature for the casting is 1400-1450°C; and/or

in the preparation method of the main alloy sheet, the copper roll for the casting has a rotational speed of 35-55 rmp/min; and/or

in the preparation method of the main alloy sheet, the copper roll for the casting has an inlet water temperature of 30°C or less; and/or

in the preparation method of the main alloy sheet, the copper roll for the casting has an outlet water temperature of 55°C or less; and/or

in the preparation method of the auxiliary alloy sheet, the temperature for smelting raw material for the auxiliary alloy sheet is 1500-1550°C; and/or

in the preparation method of the auxiliary alloy sheet, the temperature for the casting is 1500-1550°C; and/or

in the preparation method of the auxiliary alloy sheet, the copper roll for the casting has a rotational speed of 35-55 rmp/min; and/or

in the preparation method of the auxiliary alloy sheet, the copper roll for the casting has an inlet water temperature of 30°C or less; and/or

in the preparation method of the auxiliary alloy sheet, the copper roll for the casting has an outlet water temperature of 55°C or less.

9. The preparation method of the neodymium-iron-boron magnet according to claim 3, characterized in that:

the mass of the main alloy sheet accounts for 90% or more and less than 100%, preferably 94-95% of the total mass of the main alloy sheet and the auxiliary alloy sheet; and/or

in S2, a mixture of the main alloy sheet and the auxiliary alloy sheet is subjected to hydrogen decrepitation, pulverization, orientation pressing treatment, isostatic pressing treatment and sintering treatment to achieve the neodymium-iron-boron material; or, the main alloy sheet and the auxiliary alloy sheet are subjected to hydrogen decrepitation and pulverization respectively, then the fine powders obtained after pulverizing the main alloy sheet and the auxiliary alloy sheet are mixed, and then the mixed fine powder is subjected to orientation pressing treatment, isostatic pressing treatment and sintering treatment to achieve the neodymium-iron-boron material.

10. The preparation method of the neodymium-iron-boron magnet according to claim 9, characterized in that:

the dehydrogenation temperature for the hydrogen decrepitation is 540-560°C; and/or

the process of the hydrogen decrepitation is terminated within not less than 10 minutes after the pressure drop is less than 0.04 MPa;

the pulverization is jet mill pulverization; preferably, the oxygen supplement for the jet mill pulverization is 0-70 ppm; and/or

the fine particles obtained by the pulverization have a diameter of 3.5-4.5 μm; and/or

the magnetizing current for the orientation pressing is controlled at 950A-970A, such as 960A; and/or

the green compact obtained by the orientation pressing has a compact density of 3.7-4.3 g/cm^3, such as 4.1 g/cm^3; and/or

the temperature for the sintering treatment is 1025-1150°C, such as 1070-1080°C; and/or

the time for the sintering treatment is 4-10 hours, such as 8 hours; and/or

an aging treatment is performed after the sintering treatment; preferably, the aging treatment includes a primary aging and/or a secondary aging; the temperature for the primary aging is preferably 850-940°C, and the time for the primary aging is preferably 2-5 hours; and the temperature for the secondary aging is preferably 420-640°C, and the time for the secondary aging is preferably 2-5 hours.