

Title (en)

Dual-phase steel, flat product made of such dual-phase steel and method for manufacturing a flat product

Title (de)

Dualphasenstahl, Flachprodukt aus einem solchen Dualphasenstahl und Verfahren zur Herstellung eines Flachprodukts

Title (fr)

Acier en phase double, produit plat à partir d'un tel acier en phase double et son procédé de fabrication

Publication

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Application

EP 07114399 A 20070815

Priority

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Abstract (en)

Dual-phase steel comprises 20-70% of martensite, up to 8% of residual austenite and balance of ferrite and/or bainite and which possess a tensile strength of at least 950 MPa, and composition of e.g. manganese (2.1-2.8 wt.%), chromium (0.2-0.8 wt.%), titanium (0.02-0.10 wt.%), boron (less than 0.002 wt.%), molybdenum (less than 0.25 wt.%), aluminum (less than 0.1 wt.%), copper (up to 0.2 wt.%), nickel (up to 0.1 wt.%), calcium (up to 0.005 wt.%), phosphorus (up to 0.2 wt.%), sulfur (up to 0.01 wt.%), nitrogen (up to 0.012 wt.%) and balance of iron and unavoidable contamination. Dual-phase steel comprises 20-70% of martensite, up to 8% of residual austenite and balance of ferrite and/or bainite and which possess a tensile strength of at least 950 MPa, and composition of carbon (0.050-0.105 wt.%), silicon (0.2-0.6 wt.%), manganese (2.1-2.8 wt.%), chromium (0.2-0.8 wt.%), titanium (0.02-0.10 wt.%), boron (less than 0.002 wt.%), molybdenum (less than 0.25 wt.%), aluminum (less than 0.1 wt.%), copper (up to 0.2 wt.%), nickel (up to 0.1 wt.%), calcium (up to 0.005 wt.%), phosphorus (up to 0.2 wt.%), sulfur (up to 0.01 wt.%), nitrogen (up to 0.012 wt.%) and balance of iron and unavoidable contamination. Independent claims are included for: (1) a flat product comprising the dual-phase steel; (2) production of a hot laminated strip with a tensile strength of at least 950 MPa and a dual phase structure, comprising melting the dual-phase steel, pouring the melt to a preproduct such as slab or thin slab, reheating or holding the preproduct at a hot rolling starting temperature of 1100-1300[deg] C, hot rolling the preproduct at a hot rolling temperature of 800-950[deg] C to the hot laminated strip and winding the hot laminated strip at a winder temperature of up to 650[deg] C, preferably 500-650[deg] C; and (3) production of a cold strip with a tensile strength of at least 950 MPa and a dual phase structure, comprising melting the composite dual-phase steel, pouring the melt to a preproduct such as slab or thin slab, reheating or holding the preproduct at a hot rolling starting temperature of 1100-1300[deg] C, hot rolling the preproduct at a hot rolling temperature of 800-950[deg] C to the hot laminated strip, winding the hot laminated strip at a winder temperature of up to 650[deg] C, preferably 500-650[deg] C, cold rolling the hot laminated strip to a cold strip, tempering the cold strip to a tempering temperature of 700-900[deg] C and controlled cooling of the tempered cold strip.

Abstract (de)

Die Erfindung stellt einen Dualphasenstahl, ein Flachprodukt und Verfahren zu dessen Herstellung zur Verfügung, der bei einer Festigkeit von mindestens 950 MPa und einer guten Verformbarkeit eine Oberflächenbeschaffenheit besitzt. Der erfindungsgemäße Stahl erlaubt es, unter Anwendung eines einfachen Herstellverfahrens das aus diesem Stahl erzeugte Flachprodukt im unbeschichteten oder mit einem vor Korrosion schützenden Überzug versehenen Zustand zu einem komplex geformten Bauteil, wie einem Teil einer Automobilkarosserie, zu verformen. Dazu weist der erfindungsgemäße Stahl ein zu 20 - 70 % aus Martensit, bis zu 8 % aus Restaustenit und als Rest aus Ferrit und / oder Bainit bestehendes Gefüge und folgende Zusammensetzung auf (in Gew.-%): C: 0,050 - 0,105 %, Si: 0,20 - 0,60 %, Mn: 2,10 - 2,80 %, Cr: 0,20 - 0,80 %, Ti: 0,02 - 0,10 %, B: < 0,0020 %, Mo: < 0,25 %, Al: < 0,10 %, Cu: bis zu 0,20 %, Ni: bis zu 0,10 %, Ca: bis zu 0,005 %, P: bis zu 0,2 %, S: bis zu 0,01 %, N: bis zu 0,012 % und als Rest Eisen und unvermeidbare Verunreinigungen.

IPC 8 full level

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CPC (source: EP US)

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Citation (search report)

- [A] JP 2000282175 A 20001010 - KAWASAKI STEEL CO
- [A] EP 0753596 A1 19970115 - NIPPON STEEL CORP [JP]
- [A] EP 1367143 A1 20031203 - NIPPON KOKAN KK [JP]
- [A] US 2005139293 A1 20050630 - NOMURA MASAHIRO [JP], et al
- [A] JP H08311600 A 19961126 - KOBE STEEL LTD

Cited by

DE10201511177A1; DE102012002079A1; DE102014017274A1; RU2666392C2; DE102012002079B4; CN109207867A; EP3418419A4; US10612113B2; US12116647B2; WO2022184811A1; DE102017123236A1; WO2019068560A1; DE102017218434A1; WO2019076717A1; WO2015014333A3; WO2020221628A1; WO2017021464A1; WO2013113304A3; WO2013113304A2; US10273552B2; WO2019001424A1; WO2016078644A1; US10626478B2; US11453926B2

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