

Title (en)

Shape memory alloys based on iron, manganese and silicon

Title (de)

Auf Eisen, Mangan und Silizium basierende Formgedächtnislegierungen

Title (fr)

Alliages à mémoire de forme à base de fer, de manganèse et de silicium

Publication

EP 2141251 A1 20100106 (DE)

Application

EP 09162774 A 20090616

Priority

CH 9682008 A 20080625

Abstract (en)

Shape memory alloy comprises a base alloy of manganese, silicon, chromium and nickel and a residual mass fraction of iron, a mass fraction of at least 0.2 wt.% of vanadium and a specifically injected mass portion of at least 0.2 wt.% of carbon and/or nitrogen in the form of precipitated vanadium carbide precipitates and/or vanadium nitride precipitates. Independent claims are included for: (1) the use of a shape-memory alloy in civil engineering, preferably for the constriction of supports, internally prestressed cement-bound workpieces or to create improved anchoring elements, where the shape-memory alloy exhibits austenite transition temperature area with a width of less than 80[deg] C, preferably at least 40[deg] C; and (2) a process for producing a shape memory alloy, comprising melting manganese, silicon, chromium, nickel, and a mass fraction of iron, according to a subsequent addition of a mass fraction of vanadium takes place, after which a targeted addition of a mass fraction of carbon takes place and these solid shape-memory alloy is treated by a solution treatment at 1050-1150[deg] C for 5-10 hours, where a heat aging for 1-2 hours at a temperature of 650-900[deg] C is carried out to form vanadium carbide precipitates in the shape memory alloy.

Abstract (de)

Es wird eine neuartige Formgedächtnislegierung offenbart, welche aus einer Basislegierung, umfassend Massenanteile Mangan, Silizium, Chrom, Nickel und Eisen, welche mit Massenanteilen von Vanadium, Stickstoff und/oder Kohlenstoff versehen ist. Durch den beanspruchten Herstellungsprozess fallen Ausscheidungen aus Vanadiumcarbidpartikeln und/oder Vanadiumnitridpartikeln aus, wodurch ein hoher Formgedächtniseffekt möglich wird. Neben erreichbaren tiefen Austenitstarttemperaturen A_S von etwa 70 °C weisen die erfindungsgemässen Formgedächtnislegierungen schmale Austenitübergangstemperaturbereiche A_S-A_F von etwa 40 °C Breite auf. Aufgrund der erreichbaren Formgedächtniseigenschaften sind die erfindungsgemässen Formgedächtnislegierungen in Betonstrukturen im Bauingenieurwesen einsetzbar.

IPC 8 full level

C21D 6/00 (2006.01); **C21D 6/02** (2006.01); **C22C 38/00** (2006.01); **C22C 38/02** (2006.01); **C22C 38/46** (2006.01); **C22C 38/58** (2006.01)

CPC (source: EP)

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Citation (applicant)

- EP 1123983 A1 20010816 - JP [JP]
- VON KUBO ET AL.: "Characterization of Fe-Mn-Si-Cr shape memory alloys containing VN precipitates", MATERIAL SCIENCE AND ENGINEERING, vol. A378, 2004, pages 343 - 348

Citation (search report)

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- [A] WPI WORLD PATENT INFORMATION DERWENT, vol. 1994, no. 35, 19 October 1994 (1994-10-19), XP002168654 & RU 2009256 C1 19940315 - VINTAJKIN EVGENIJ Z [RU], et al
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- [A] JIAN L ET AL.: "SHAPE MEMORY EFFECT AND RELATED PHENOMENA IN A MICROALLOYED FE-MN-SI ALLOY", MATERIALS CHARACTERIZATION, ELSEVIER, NEW YORK, NY, US, vol. 32, no. 3, 1 January 1994 (1994-01-01), pages 215 - 227, XP000989417, ISSN: 1044-5803
- [A] K.MOSER ET AL.: "Feasibility of concrete prestressed by shape memory alloy short fibers", MATERIALS AND STRUCTURES, vol. 38, no. 279, 1 June 2005 (2005-06-01), pages 593 - 600, XP002551336

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