

Title (en)

METAL TUBE FOR USE IN CARBURIZING GAS ATMOSPHERE

Title (de)

METALLROHR ZUR VERWENDUNG IN AUFKOHLUNGSGASATMOSPHERE

Title (fr)

TUBE EN METAL DESTINE A ETRE UTILISE DANS UNE ATMOSPHERE DE GAZ DE CEMENTATION

Publication

**EP 1717330 A1 20061102 (EN)**

Application

**EP 05709298 A 20050125**

Priority

- JP 2005000892 W 20050125
- JP 2004035261 A 20040212
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Abstract (en)

A metal tube having the ability to protect against carburizing gas and having improved resistance to metal dusting, to carburization, and to coking has a Cu-enriched layer with a Cu concentration of at least 0.1 atomic percent and a thickness of at least 0.3 nm in a surface region of the metal tube. The alloy composition of the base metal of the metal tube contains, in mass percent, Cr: 15 - 35%, Ni: 30 - 75%, Al: 0.001 - 10%, and Cu: 0.01 - 10%. An oxide scale comprising predominantly Cr with a Cr content of at least 50% or an oxide scale comprising predominantly Cr and Al with a total content of Cr + Al of at least 50% may further be provided on the outer side of the Cu-enriched layer, and between this oxide scale and the Cu-enriched layer, a second oxide scale comprising predominantly Si with an Si content of at least 50% may be provided.

IPC 8 full level

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CPC (source: EP)

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Cited by

EP2479300A4; US2013287624A1; DE102009022203B3; EP3239311A4; US2013287623A1; US9394591B2; RU2653376C1; DE102010049781A1; CN103882264A; RU2632497C2; RU2693417C1; US2014238552A1; CN104838020A; KR20150120929A; US9869003B2; AU2014221415B2; EP1780295A4; US2014044587A1; US9399807B2; RU2635411C2; US9228250B2; US10502252B2; US11215356B2; US10337093B2; WO2014023274A1; US8801876B2; US10422027B2; US9765420B2; US10144999B2; US8858875B2; US9796005B2; DE102009012003A1; WO2010097300A1; US9624567B2; US9616480B2; US10287655B2; US10570469B2; TWI588268B; US11111552B2; US11162151B2; US10094003B2; US10619226B2; US10808298B2; US11319616B2; US9938609B2; US10053758B2; US10435775B2; US10513755B2; US9249482B2; US9777361B2; US10053756B2; US10370751B2

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