

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
3 February 2005 (03.02.2005)

PCT

(10) International Publication Number
WO 2005/010233 A2

(51) International Patent Classification⁷: **C23C 18/31**

(21) International Application Number:
PCT/US2004/011417

(22) International Filing Date: 14 April 2004 (14.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/606,460 26 June 2003 (26.06.2003) US

(71) Applicant (for all designated States except US):
ATOTECH DEUTSCHLAND GMBH [DE/DE];
D-10507 Berlin Erasmustrasse 20, 10553 Berlin (DE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JOSHI, Nayan H.**
[US/US]; 2168 Summers Glen, Rock Hill, South Carolina
29732 (US). **MEHTA, Maulik D.** [US/US]; 4305 Quail
View Road, Charlotte, North Carolina 28226 (US).

(74) Agents: **BOISSELLE, Armand P.** et al.; Renner, Otto,
Boisselle & Sklar, LLP, 1621 Euclid Avenue, 19th Floor,
Cleveland, OH 44115 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,
GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: AQUEOUS ACIDIC IMMERSION PLATING SOLUTIONS AND METHODS FOR PLATING ON ALUMINUM AND ALUMINUM ALLOYS

(57) Abstract: The present invention provides a non-cyanide aqueous acidic immersion plating solution having a pH of from about 3.5 to about 6.5 and comprising zinc ions, nickel ions and/or cobalt iron ions, and fluoride ions. In one embodiment the immersion plating solutions of the invention also contain at least one inhibitor containing one or more nitrogen atoms, sulfur atoms, or both nitrogen and sulfur atoms. The present invention also relates to methods for depositing zinc alloy protective coatings on aluminum and aluminum alloy substrates comprising immersing the aluminum or aluminum alloy substrate in the non-cyanide acidic immersion plating solutions of the invention. Optionally, the zinc alloy coated aluminum or aluminum alloy substrate is plated using an electroless or electrolytic metal plating solution.



WO 2005/010233 A2