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(54) Title: ALKOXYLATED DIMERCAPTANS AS COPPER ADDITIVES

(57) Abstract

A copper electroplating process using alkoxylated dimercaptan ethers as an additive. The additives prevent dendritic formations which short out electrodes.

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INTERNATIONAL SEARCH REPORT

Intern. .al Application No
PCT/US 97/08632

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C25D3/38 C25C1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C25D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 417 841 A (FRISBY C RICHARD) 23 May 1995 ---	
A	US 4 376 685 A (WATSON ANGUS) 15 March 1983 -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 September 1997	09. 01. 98

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Van Leeuwen, R

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 97/08632

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see annex

1 ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3 ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

claims 1-7 and 18-19

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

a. 1-7 and 18-19
b. 8-17
c. 21-23
d. 20

The first set a. deals with a method for electroplating a copper deposit in a bath, which includes an alkoxylated dimercaptan ether additive.

The second set b, relates to a method for electrorefining a copper deposit in a bath, which includes an alkoxylated dimercaptan ether additive.

The third set c. describes a process for electrorefining of copper using a depolarizing additive having the formula:

A-R1-(S)n-R2-Q-O3B

Symbols A. B. Q . R1 and R2 are described in the present application.

The fourth set deals with a electrowinning process using the additive of claim 2.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. al Application No
PCT/US 97/08632

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5417841 A	23-05-95	DE 69110208 D	13-07-95
		DE 69110208 T	19-10-95
		EP 0469724 A	05-02-92
		JP 5214586 A	24-08-93
US 4376685 A	15-03-83	AU 548506 B	12-12-85
		AU 8389482 A	06-01-83
		CA 1194832 A	08-10-85
		EP 0068807 A	05-01-83
		JP 1677428 C	13-07-92
		JP 3040113 B	17-06-91
		JP 58003991 A	10-01-83