# THE CHEMISTRY OF CYANIDE SOLUTIONS RESULTING FROM THE TREATMENT OF ORES

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649142408

The chemistry of cyanide solutions resulting from the treatment of ores by J. E. Clennell



Edited by Trieste Publishing Pty Ltd.
Cover @ 2017



www.triestepublishing.com

J. E. CLENNELL

# THE CHEMISTRY OF CYANIDE SOLUTIONS RESULTING FROM THE TREATMENT OF ORES

Trieste

# THE CHEMISTRY OF CYANIDE SOLUTIONS

Published by the

McGraw-Hill Book Company

New York

Successors to the Book Departments of the

McGraw Publishing Company — Hill Publishing Company

Publishers of Books for

Electrical World
The Engineering Record
Electric Railway Journal
The Engineering and Mining Journal
Power and The Engineer
American Machinist

# THE CHEMISTRY OF CYANIDE SOLUTIONS

## RESULTING FROM THE TREATMENT OF ORES

*By*

J. E. CLENNELL, B.Sc. (LOND.)

ASSOCIATE OF THE INSTITUTION OF MINING AND METALLURGY

ASSOCIATE OF THE CHEMICAL, METALLURGICAL, AND MINING SOCIETY OF SOUTH AFRICA

Author of *"Analytical Work in Connection with the Cyanide Process"*

*SECOND EDITION*

CORRECTED AND ENLARGED



NEW YORK

McGRAW-HILL BOOK COMPANY

239 WEST 39TH STREET

1910

# CONTENTS.


| | PAGE |
|---|---|
| INTRODUCTORY | 1 |
| INGREDIENTS OF CYANIDE SOLUTIONS THAT ARE ESTIMATED | 2 |
| ACTIVE CYANOGEN COMPOUNDS | 4 |
| Free Cyanide | 4 |
| Total Cyanide | 33 |
| Total Cyanogen | 47 |
| Hydrocyanic Acid | 52 |
| Available Cyanide | 54 |
| ALKALINE CONSTITUENTS | 58 |
| Total Alkali | 62 |
| Protective Alkali | 63 |
| Hydrates, Carbonates and Bicarbonates | 66 |
| Ammonia | 68 |
| REDUCING AGENTS | 70 |
| Reducing Power | 70 |
| Ferrocyanides | 73 |
| Thiocyanates | 87 |
| Sulphides | 90 |
| Other Reducing Agents | 93 |
| AUXILIARY AGENTS | 95 |
| Oxygen | 95 |
| Active Haloids | 100 |
| Peroxides | 101 |
| Ferricyanides | 102 |
| INACTIVE BODIES | 104 |
| Cyanates and Isocyanates | 108 |
| Chlorides | 112 |
| Nitrates | 112 |
| Sulphates | 112 |
| Silicates | 113 |

PAGE

NOBLE METALS..... 114
Gold and Silver Together..... 114
Gold Alone..... 118
Silver Alone..... 120
BASE METALS..... 123
Zinc..... 123
Copper..... 123
Iron, Alkaline Earths and Alkali Metals..... 137
SUSPENDED MATTER..... 138
Total Solids in Suspension..... 138
Various Constituents in Suspended Matter..... 140
Total Solids in Solution..... 141
AN EXAMINATION OF VARIOUS METHODS FOR THE ESTIMATION OF FERROCYANIDE..... 143
APPENDICES..... 161–198

# INTRODUCTORY.

In preparing the following treatise, my object has been not so much to give the results of any special researches on individual obscure points as to present a comprehensive and, so far as possible, complete review of the entire subject. For this purpose a short description of well-known methods is introduced, and, where necessary, a critical discussion of their value. I have also described the various modifications of existing methods that have been suggested from time to time, but which have not hitherto been collected and compared, and have given the results of experiments made to test the accuracy of the assumptions on which such modifications are based. While, for the sake of completeness and the clear presentation of the subject, it has been necessary to include much that is already familiar, it is hoped that the points discussed are shown to be of sufficient interest and importance to justify a somewhat extended investigation.

A systematic study of the solutions resulting from the continued working of the cyanide process on some particular class of ore may throw much light on the chemical and economic problems involved in the treatment, and in some instances has proved of great practical value. It is highly desirable, therefore, to have a fairly simple, rapid and reliable system of laboratory tests for determining the amount of any of the more important constituents of such solutions. In addition to these laboratory methods, one or two rough tests are needed which will suffice for controlling the daily routine operations of the plant; such tests should give a clear and unmistakable indication, and should represent some factor of real value in the treatment, though strict scientific accuracy is not a necessity in this case.

---

NOTE.—The author, owing to absence on professional work, was unable to revise his proofs. The revision was done by Mr. H. E. Bowles, F.I.C., to whom acknowledgment is due by the publishers for this courtesy.