

INDUSTRIAL
CHEMICALS
DIVISION



Bulletin 21A

The Re-emergence of PQ[®] Sodium Silicate in Sulfide Mineral Flotation

INTRODUCTION

Sodium Silicate is a versatile, non-toxic chemical, available in many forms for a wide range of industrial applications.

Type N[®] liquid sodium silicate is the type most often used in mineral processing applications:

N[®] Sodium Silicate

- Weight ratio SiO₂/Na₂O = 3.22
- 28.7% SiO₂, 8.9% Na₂O, 62.4% H₂O
- 37.6% solids
- pH = 11.3
- Density = 1.38g/cc @ 20°C
- Viscosity = 180cp @ 20°C



MINERAL PROCESSING

Depressant:

- large doses 1-5 kg/t ore
- quartz, silicate minerals, calcite, fluorite, barite

Dispersant:

- small doses, 0.05-0.50 kg/t ore
- grinding and flotation
- siliceous minerals, iron oxide, sulfide ore
- selective dispersion and flocculation

Grinding Aid:

- lowers viscosity
- provides finer grinding or increase throughput for same particle sizes

ADVANTAGES

- non-toxic
- cost effective
- no detrimental dewatering effects
- provides more stable operations

PQ CORPORATION

CORPORATE HEADQUARTERS

PO Box 840
Valley Forge, PA 19482-0840
Phone: 800-944-7411

IN CANADA

National Silicates
Phone: 416-255-7771

IN MEXICO

Silicates y Derivados, S.A.
Phone: 52-555-227-6801

IN EUROPE

PQ Europe
Phone: 31-33-450-9030

IN AUSTRALIA

PQ Australia Pty. Ltd.
Phone: 61-3-9708-9200

IN TAIWAN

PQ Silicates Ltd.
Phone: 886-2-2383-0515

PQ Corporation is a privately held global enterprise operating in 19 countries, with annual revenues in excess of \$500 million. PQ is a leading producer of silicate, zeolite, and other performance materials serving the detergent, pulp and paper, chemical, petroleum, catalyst, water treatment, construction, and beverage markets.

Potters Industries, PQ's wholly owned subsidiary, is a leading producer of engineered glass materials serving the highway safety, polymer additive, fine abrasive, and conductive product markets.

**INDUSTRIAL
CHEMICALS
DIVISION**



PQ CORPORATION

CORPORATE HEADQUARTERS

PO Box 840
Valley Forge, PA 19482-0840
Phone: 800-944-7411

IN CANADA

National Silicates
Phone: 416-255-7771

IN MEXICO

Silicates y Derivados, S.A.
Phone: 52-555-227-6801

IN EUROPE

PQ Europe
Phone: 31-33-450-9030

IN AUSTRALIA

PQ Australia Pty. Ltd.
Phone: 61-3-9708-9200

IN TAIWAN

PQ Silicates Ltd.
Phone: 886-2-2383-0515

N is a registered trademark of PQ Corporation.

Although the information and suggestions in this brochure ("information") are believed to be correct, PQ Corporation makes no representations or warranties as to the completeness or accuracy of the information. The information is supplied upon the following conditions: The persons receiving the information will determine its suitability for their purposes; PQ Corporation will not be responsible for damages of any nature whatsoever resulting from the use of, or reliance upon, the information or the materials, devices or products to which the information refers; No information is to be construed as a recommendation to use any product, process, equipment or formulation in conflict with any patent; PQ Corporation makes no representation or warranty, express or implied, that the use thereof will not infringe any patent; and NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE MATERIALS, DEVICES OR PRODUCTS TO WHICH THE INFORMATION REFERS.

Copyright © 2003 by PQ Corporation.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publisher and copyright holder.

RESULTS OF RECENT PQ-CMRI LABORATORY STUDIES AND PLANT TRIALS

A. Platinum Group Metals

- Laboratory tests and plant trial

B. Pyritic Gold Ore Flotation - Plant Trial

- Objective: process high-clay ores
- Silicate: 0.05 kg/t to SAG mill feed chute; smaller dose to rougher conditioner

C. Copper/Zinc Cleaner Flotation - Plant Trial

- Objective: increase gangue drainage to reduce iron content and improve Zn recovery
- Silicate: 0.35 kg/t of Zn cleaner feed to cleaner flotation (0.08 lb/t ore)

D. Copper-Molybdenum Ore #1 - Laboratory Tests

- Objective: improve copper flotation performance
- Slurry Character: viscous grinding mill discharge and flotation feed
- Silicate: 0.1-0.3 kg/t, split between grinding and roughing stages

A. Results with silicate

- 30% higher concentrate grade
- CMC requirement reduced by 30%
- 0.5-1% increase in PGM recovery

B. Results with silicate

- improved recovery of gold, 5-10%
- improved froth drainage
- more stable operation

C. Results with silicate

- Zn grade increased by 2-3%
- iron in con. decreased from 10.5% to 7.7%
- Zn recovery increased by 4%



TEST CONDITION	ROUGHER CON ASSAY, %		ROUGHER CON RECOVERY %	
	Cu	Mo	Cu	Mo
Baseline	3.85	0.042	89.63	61.00
Silicate 0.10 kg/t	4.25	0.083	92.90	71.89
Silicate 0.16 kg/t	5.78	0.113	91.85	70.73
Silicate 0.23 kg/t	4.45	0.080	91.65	70.18
Silicate 0.32 kg/t	4.31	0.085	92.19	72.21

E. Copper-Molybdenum Ore #2 - Plant Trial

- Objective: evaluate performance of 55,000 tpd plant operation when sodium silicate is added to improve copper flotation
- Silicate: 0.1 kg/t to ball mills (via cyclone underflow stream), 0.04 kg/t to rougher flotation feed

E. Results with Silicate

- Cu recovery increase by 2%
- Mo recovery increase by 3.6%
- ~3% higher feed rate during trial
- 2.1 Wt. % less on 65 mesh, shows potential for increased throughput with same particle size