

## Continuous Monitoring of Vanadium Oxytrichloride Impurities during the Manufacture of TiO<sub>2</sub>

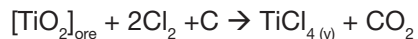
Titanium tetrachloride (TiCl<sub>4</sub>) is an intermediate in the production of titanium dioxide (TiO<sub>2</sub>) as well as titanium metals and alloys. TiO<sub>2</sub> is a white pigment used primarily in the paint, plastic and paper industries for its superior ability to completely mask a substrate

### Measurement Requirement

TiCl<sub>4</sub> purity is monitored in the manufacture of TiO<sub>2</sub>. The presence of vanadium, in the form of vanadium oxytrichloride, VOCl<sub>3</sub> in TiCl<sub>4</sub> is an impurity that affects the quality of the TiO<sub>2</sub>. The AMETEK IPS-4 Diode Array Spectrophotometer can be used to monitor VOCl<sub>3</sub> in TiCl<sub>4</sub> production, with typical ranges either in 0-20 ppmW or 0-40 ppmW VoCl<sub>3</sub> in TiCl<sub>4</sub>.

### Process Overview

TiO<sub>2</sub> is primarily manufactured using the chloride process, during which rutile (mostly TiO<sub>2</sub>) is converted to TiCl<sub>4</sub> by reacting the ore with Cl<sub>2</sub> gas around 900°C.



Next, other trace metal chlorides are removed using fractional distillation to refine the TiCl<sub>4</sub>.

Vanadium oxytrichloride (VOCl<sub>3</sub>) is a common impurity that is difficult to remove. Because the quality of the TiCl<sub>4</sub> produced directly affects the quality of the TiO<sub>2</sub> pigment and titanium metal, it is important to monitor TiCl<sub>4</sub> purity.

Finally, the TiCl<sub>4</sub> is oxidized to produce pure TiO<sub>2</sub>



The AMETEK IPS-4 Diode Array Spectrophotometer, a full spectrum analyzer, is well suited for this measurement. After collecting the spectrum the on-board computer performs a full spectrum analysis in the determination of VOCl<sub>3</sub> in TiCl<sub>4</sub>.

The total time measurement and calculations is less than 4 seconds. The multivariate calibration accounts for specific interferences caused by the sample stream. The IPS-4 is capable of monitoring specific wavelengths and performing multi-component analysis. For this application, measurements are taken between 365 and 450 nm to avoid inherent interferences of the process.

The IPS-4's unique flow cell design separates the process sample from the spectrophotometer, simplifying installation and eliminating any possibility of sample damage to the electronics.



AMETEK's IPS-4 Diode Array Spectrophotometer

**AMETEK**®  
PROCESS INSTRUMENTS

422 Corporate Blvd., Newark DE 19702  
Ph. +1-302-456-4400, Fax +1-302-456-4444  
www.ametekpi.com



© 2011 by AMETEK, Inc.  
All rights reserved. Printed in the U.S.A.  
F-0232 Rev. 2 (0311)

One of a family of innovative process analyzer solutions from AMETEK Process Instruments.  
Specifications subject to change without notice.

### SALES AND MANUFACTURING:

**USA - Delaware**  
455 Corporate Blvd., Newark DE 19702 • Tel: +1-302-456-4400, Fax: +1-302-456-4444

**USA - Oklahoma**  
2001 N. Indianwood Ave., Broken Arrow OK 74012 • Tel: +1-918-250-7200, Fax: +1-918-459-0165

**USA - Pennsylvania**  
150 Freeport Road, Pittsburgh PA 15238 • Tel: +1-412-828-9040, Fax: +1-412-826-0399

### WORLDWIDE SALES AND SERVICE LOCATIONS:

**USA - Texas**  
Tel: +1-713-466-4900, Fax: +1-713-849-1924

**CHINA**  
Beijing / Tel: 86 10 8526 2111, Fax: 86 10 8526 2141  
Chengdu / Tel: 86 28 8675 8111, Fax: 86 28 8675 8141  
Guangzhou / Tel: 86 20 8363 4768, Fax: 86 20 8363 3701  
Shanghai / Tel: 86 21 5868 5111, Fax: 86 21 5866 0969

**FRANCE**  
Tel: 33 1 30 68 89 20, Fax: 33 1 30 68 89 29

**GERMANY**  
Tel: 49 21 59 91 36 0, Fax: 49 21 59 91 3639

**INDIA**  
Tel: 91 80 6782 3200, Fax: 91 80 6782 3232

**SINGAPORE**  
Tel: 65 6484 2388, Fax: 65 6481 6588