



## Application Note AN-T-234

# Direct comparison of OMNIS and Titrande for mixed acids and TMAH

## Comparative titration with OMNIS Titrator and 888 Titrande

Ever since its introduction, the OMNIS platform has been compared to other high-quality Metrohm devices and software. Understandably, OMNIS has had to demonstrate its superior performance over these established systems. One satisfied customer from Taiwan did exactly that and found that the results obtained with OMNIS are even more accurate than with the well-proven Titrande system.

The OMNIS buret with a 100,000 step resolution is superior to the Titrande, with a resolution of either 20,000 steps (Exchange unit) or 10,000 steps (Dosing

unit). Furthermore, improved performance of the dTodes with faster signal transfer and reduced signal noise ensures better results than when using analog electrodes.

This Application Note highlights customer-provided results of determinations of nitric acid, phosphoric acid, and acetic acid in an aluminum etching bath, as well as the determination of tetramethylammonium hydroxide (TMAH). Comparisons were made by using an OMNIS Titrator and an 888 Titrande with identical analysis parameters.

## SAMPLES AND SAMPLE PREPARATION

This application is demonstrated on aluminum etching bath and tetramethylammonium hydroxide

(TMAH) samples. The sample preparation is subject to a confidentiality agreement with the customer.

## EXPERIMENTAL

The determinations are carried out on an OMNIS Professional Titrator equipped with a dEcotrode Plus (Figure 1) and an 888 Titrande equipped with an Ecotrode Plus. All selected parameters were identical. The precise determination, the exact parameters, the chemicals used, and the titrant are subject to customer confidentiality.



**Figure 1.** OMNIS Professional Titrator equipped with a dEcotrode Plus.

## RESULTS

A summary of results for the comparison of OMNIS and Titrande for aluminum etching bath samples is

shown in **Table 1**. The full results for each set of determinations are displayed in **Tables 2–4**.

**Table 1.** Overview of the results of nitric, phosphoric, and acetic acid determination in aluminum etching bath samples with an OMNIS Titrator and an 888 Titrande.

Device	HNO <sub>3</sub> (%)	H <sub>3</sub> PO <sub>4</sub> (%)	HAc (%)
OMNIS SD(rel)	4.89	70.16	9.78
	0.37	0.06	0.70
Titrande SD(rel)	4.97	70.07	9.73
	0.28	0.14	1.56

**Table 2.** Results of nitric, phosphoric, and acetic acid determination in aluminum etching bath samples on different days with an 888 Titrando.

Day	HNO <sub>3</sub> (%)	H <sub>3</sub> PO <sub>4</sub> (%)	HAc (%)
1	4.96	69.99	9.86
	4.97	69.94	9.99
2	4.96	70.15	9.69
	4.96	70.14	9.67
3	4.97	70.14	9.66
	4.98	70.21	9.52
4	4.97	70.10	9.64
	4.95	69.99	9.80
5	5.00	70.13	9.59
	4.97	69.92	9.92
Mean	4.97	70.07	9.73
SD(abs)	0.01	0.10	0.15
SD(rel)	0.28	0.14	1.56

**Table 3.** Results of nitric, phosphoric, and acetic acid determination in aluminum etching bath samples on different days with an OMNIS Titrator.

Day	HNO <sub>3</sub> (%)	H <sub>3</sub> PO <sub>4</sub> (%)	HAc (%)
1	4.87	70.13	9.87
	4.87	70.12	9.84
2	4.88	70.16	9.73
	4.87	70.17	9.77
3	4.89	70.26	9.70
	4.91	70.14	9.78
4	4.90	70.16	9.69
	4.90	70.14	9.78
5	4.92	70.13	9.72
	4.90	70.18	9.88
Mean	4.89	70.16	9.78
SD(abs)	0.02	0.04	0.07
SD(rel)	0.37	0.06	0.70

**Table 4.** Results of tetramethylammonium hydroxide (TMAH) determination in  $\beta$ (TMAH) = 2.380% samples on different days with an 888 Titrando and an OMNIS Titrator.

	888 Titrando	OMNIS Titrator
Day	Result (%)	Result (%)
1	2.3820	2.3788
	2.3814	2.3794
	2.3813	2.3786
2	2.3818	2.3785
	2.3810	2.3780
	2.3816	2.3781
3	2.3792	2.3776
	2.3799	2.3779
	2.3803	2.3780
Mean	2.3809	2.3783
SD(abs)	0.0009	0.0006
SD(rel)	0.040	0.023

## CONCLUSION

In addition to manufacturing high-quality analytical instruments, customer satisfaction is extremely important to Metrohm. The data collected and shared in this Application Note from a satisfied customer in Taiwan clearly shows the outstanding performance of

Metrohm titrators.

Aside from improving the precision and speed of the determinations, OMNIS delivers results on par or even better than with other established titration systems.

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## CONFIGURATION



### OMNIS Professional Titrator avec agitateur magnétique

OMNIS Titrator, innovant, modulaire, potentiométrique pour un mode autonome ou en tant que pièce centrale d'un système de titrage OMNIS pour le titrage à point final et à point d'équivalence (monotone/dynamique). Grâce à la technologie 3S de l'adaptateur Liquid Adapter, la manipulation des produits chimiques est plus sûre que jamais. Avec des modules de mesure et des unités de cylindre, le titreur peut être librement configuré et il est possible au besoin d'y ajouter un agitateur à tige. Licence fonctionnelle « Professional » incluse pour le titrage en parallèle avec d'autres modules de titrage ou de dosage.

- Commande via PC ou un réseau local
- Possibilité de connecter jusqu'à quatre autres modules de titrage ou de dosage pour d'autres applications ou solutions auxiliaires
- Possibilité de connecter un agitateur à tige
- Différentes tailles de cylindre disponibles : 5, 10, 20 ou 50 mL
- Liquid Adapter avec la technologie 3S : Manipulation de produits chimiques plus sûre, transfert automatique des données originales des réactifs provenant des fabricants

#### Modes de mesure et options logicielles :

- Titrage à point final : licence fonctionnelle « Basic »
- Titrage à point final et à point d'équivalence (monotone/dynamique) : licence fonctionnelle « Advanced »
- Titrage à point final et à point d'équivalence (monotone/dynamique) avec titrage en parallèle : licence fonctionnelle « Professional »