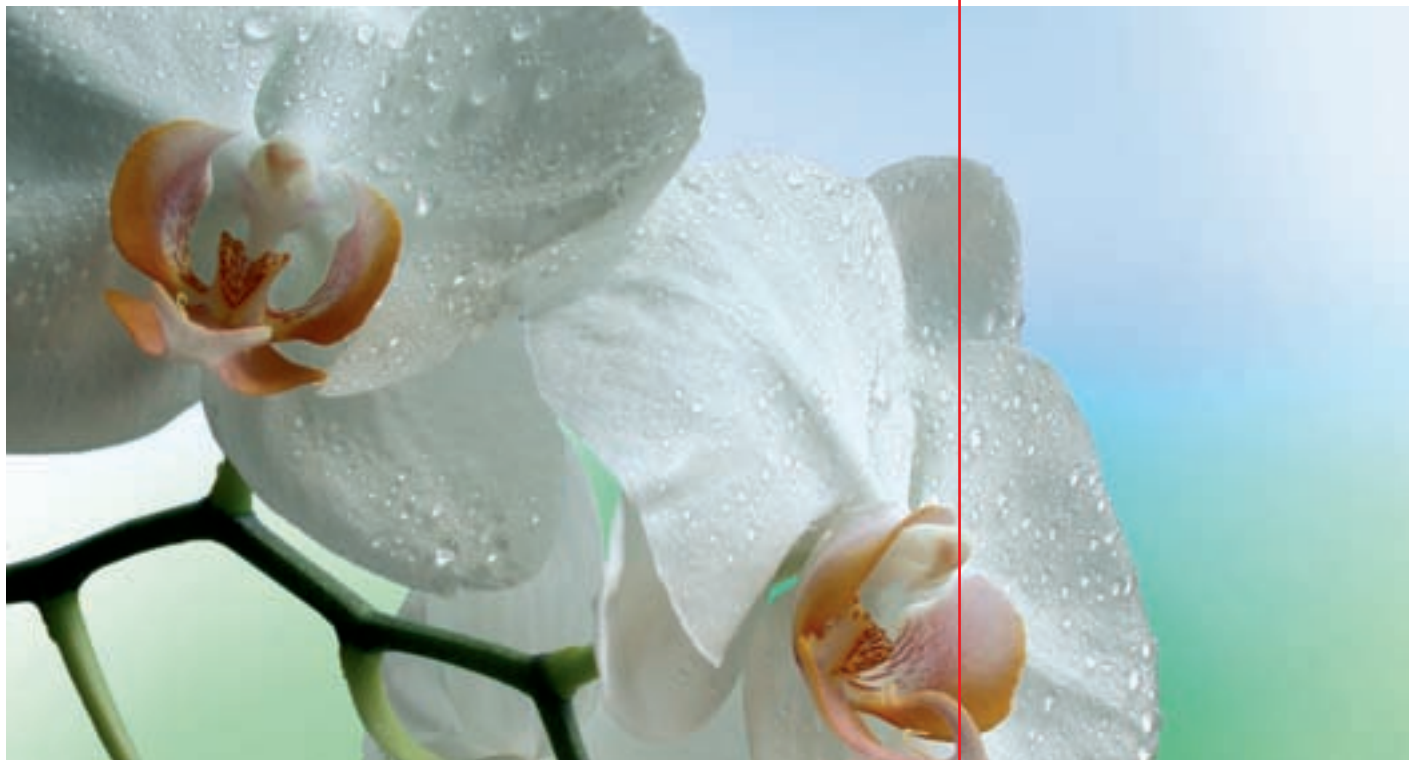


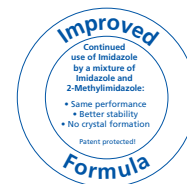
# Analytix *LabInfo*



## HYDRANAL<sup>®</sup>-Composite

**Improved one-component reagent for volumetric Karl Fischer titration** ..... HYDRANAL-Composite is the world's most frequently used pyridine-free Karl-Fischer reagent. This single-component reagent has been proving its capabilities in volumetric titration for more than twenty years in a large range of applications in the most diverse fields of research and industry. Recent development work has achieved significant improvements to this reagent.

[www.sigma-aldrich.com/hydranal](http://www.sigma-aldrich.com/hydranal)



### Development of the reagent

Sulfur dioxide, alcohol, iodine and water react with each other at stoichiometric ratios in the Karl-Fischer reaction. The sulfur dioxide and the acid generated during the reaction are neutralized using a suitable alkali in order to keep the reaction solution within the optimum pH range. The alkali used has, up to now, been the tried and proven imidazole. The development laboratory has produced improved formulation based on a mixture of imidazole and 2-methyl imidazole. The advantageous buffering action of the imidazole is thus retained, and therefore also the typical pH range during titration. This adjustment of the composition at the same times achieved significant improvements to the product. All HYDRANAL-Composite reagents contain this formulation and can be visually identified by the „Improved Formula“ stamp.

### Enhancement of titre stability

Compared to the composition used up to now, the new formulation exhibits greater reagent titre stability. The results of the tests into titre decline of HYDRANAL-Composite formulations on the basis of imidazole (old formulation) and of the mixture of imidazole and 2-methyl imidazole (new formulation) are shown in **Figure 1**.

### Reduction of crystallization effects

The crystallization effects occasionally observed under the influence of airborne moisture and also after prolonged residence of the reagent in the KF titrator's hose system are prevented by the improved formulation.

### Checking of comparability

A process validation has been formed for both formulations. It was ascertained that the two formulations exhibit no significant differences in rates of reaction. Ten titrations using 34849 HYDRANAL-Water Standard 10.0 were performed for investigation of other important process parameters, such as recovery rate and its standard deviation. This standard is tested against NIST standard SRM 2890. An extremely high accuracy was determined for both formulations. As can be seen in Table 1, the results for the two reagents also accord extremely well on a comparative basis, too. (**Table 2**)

The HYDRANAL-Laboratory performed comparative tests for both formulations using specimen materials from the most diverse range of applications. For this purpose, water tests were performed in inorganic substances such as acids, organic substances such as gasoline, diesel, various solvents and ketones, in products such as commercial preservation agents and brake fluid, pharmaceutical products, dairy products, up to and including confectionery. Both formulations exhibited the same titration performance in tests on these extremely diverse substances. No significant deviations were observed in the results obtained.

### Toxicological tests

Toxicological studies performed under GMP conditions confirm that the use and handling of both formulations can be classified as harmless to the health of the persons involved. The affixing of a hazard symbol to our HYDRANAL-Composite reagents is therefore not

necessary on the basis of these studies and the EU directive concerning classification and marking.

### Technical support

We'll be glad to provide you with support in the analysis of your sample based on our twenty years of experience with Karl Fischer titration. We can suggest a solution to your analytical problem and, if necessary, develop an individual analytical method for you. Our comprehensive application collection makes daily work easier for HYDRANAL-users, and is always at your disposal anytime.

Just call us! We'll be pleased to answer any questions regarding sample analysis using the Karl Fischer method, and on HYDRANAL-reagents.

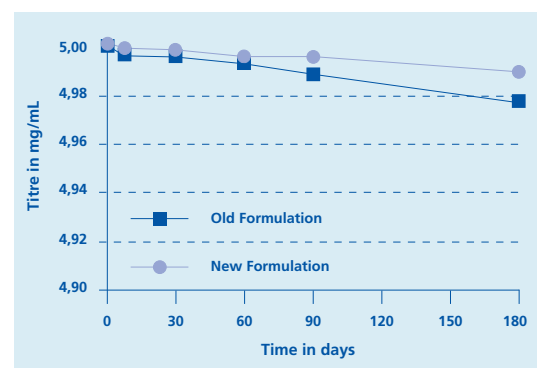


Figure 1 ..... Results of the test for titre stability.

Parameter	HYDRANAL-Composite Formulation	
	Old	Improved
Mean in mg H <sub>2</sub> O	10.04	10.03
Recovery rate in %	100.1	100.0
RSD in %	0.06	0.08

Table 2 ..... Determination of process parameters using HYDRANAL-Water Standard 10.0 (n = 10). The effective water content of the HYDRANAL-Water Standards 10.0 used 10.03 mg/g.

Cat. No.	Product Name	Description	Pack Size
34827	HYDRANAL-Composite 1	One component reagent, titer: 1 mL ~ 1 mg water	500 mL; 1 L
34806	HYDRANAL-Composite 2	One component reagent, titer: 1 mL ~ 2 mg water	500 mL; 1 L; 2.5 L
34805	HYDRANAL-Composite 5	One component reagent, titer: 1 mL ~ 5 mg water	500 mL; 1 L; 2.5 L
34816	HYDRANAL-Composite 5K	One component reagent for titration of aldehydes and ketones, titer: 1 mL ~ 5 mg water	500 mL; 1 L; 2.5 L

### Europe and Rest of World:

Ms. Helga Hoffmann  
 Technical Service HYDRANAL  
 Tel. +49-5137/8238-353  
 Fax +49-5137/8238-698  
 E-mail: helga.hoffmann@sial.com

### USA and Canada:

Mr. Doug Clark  
 HYDRANAL Technical Center North America  
 Help-Line: +1-800-493-7262  
 (toll free hotline for USA and Canada)  
 Fax: +1-314-286-6699, E-mail: doug.clark@sial.com

HYDRANAL is a registered trademark of Sigma-Aldrich Laborchemikalien GmbH.