Drying Agent Selection for Karl Fischer Titration with AQUASTAR®

Pyridine-free Reagents

Atmospheric moisture accounts for a substantial portion of errors encountered when performing Karl Fischer (KF) titrations. This is of particular concern in regions where high humidity is common. Even in air-conditioned laboratories, the effects of atmospheric moisture can be substantial, unless the air conditioning system includes a moisture condenser. This is due to the fact that the colder the air gets, the less moisture it is able to absorb, leading to an increase in relative humidity. Thus, it is not advisable to locate KF titration equipment directly in front of air conditioning system vents.

Under conditions of 20-25°C (68-77°F) and 60% relative humidity, 1.0 mL of air contains between 12 and 14 µg of water. Water content of air will increase at higher temperatures and with higher relative humidity.

Since no titration vessel is hermetically sealed, small amounts of atmospheric moisture will continuously enter the vessel. The amount of this "background" water penetrating the titration vessel is known as the drift, and is specified in units of µg H_2O per minute. When the drift is relatively low (<10 µg H_2O/min) and stable, it can be compensated for automatically by the titrator during analysis. However, a drift that is high and/or unstable leads to greater scatter and reduces the accuracy of results.

Therefore, taking all possible precautions to eliminate the entry of atmospheric moisture into the titration cell is key to ensuring accurate and reproducible results. Proper titration vessel maintenance, including regular greasing of all ground glass joint and o-rings, is one important factor in achieving this goal. The other factor is the choice of drying agent for the titrator drying tubes.

Drying agents suitable for this purpose include molecular sieve, alumina, silica gel, and others. For maximum drying efficiency, we recommend using **t.h.e.® Desiccant**, available in 100% indicating (DX0017) and 8% indicating (DX0014) forms. **t.h.e.® Desiccant** beads, which are spherical and chemically inert, are characterized by high adsorptive capacity and efficiency. The color of the beads turns from deep blue to pink with hydration, thus alerting the analyst to the need for changing the drying agent. Fully hydrated **t.h.e.® Desiccant** beads can be regenerated by heating at 120°C for 1-2 hours.

The following table illustrates the relative moisture adsorption capacities of the various drying agents.

Desiccant	Typical % Water Adsorbed
t.h.e.® Desiccant	**35.8**
Silica gel	30.4
Molecular sieve 13X	25.3
Molecular sieve 3A	21.7
Alumina	13.4

For additional **AQUASTAR®** product Technical and Applications Support call: **1-800-222-0342**

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