Titration with Alcoholic Potassium Hydroxide Solution

In the production control and quality monitoring of our corrosion protection, hydraulic, cutting and gear oils, we determine the acid content by titration (color change). Depending on the task definition, we use either a 0.1 M or 0.5 M alcoholic potassium hydroxide (KOH) solution.

Alcoholic KOH is considered to be a difficult titration medium due to the extensive crystallization, and not every burette passes the practical usage test. Until now, we have worked with glass burettes and on a trial basis with the Burette Digital III. Since September 2008 we have been using the new Brand Titrette satisfactorily. It is a manually driven digital bottletop burette similar to the previous model, but it has been substantially improved.

After extensive testing we can confirm the easy operation and robust construction of the Burette, that means instrument properties which are of particular importance for us working in shifts. Drop wise titration proceeds much more simple, and the measurement results are highly accurate with much less variability. The advantage of the easy dismantling of the instrument, for cleaning purposes or replacement of piston or cylinder is only noticed upon further inspection.

Most helpful for our applications were the practical notes on handling alcoholic KOH in the instruction manual, in addition to the direct contact to the manufacturer when there were questions on use. Thus, for example, it is recommended to adjust the filling tube length to maintain a distance of approx. 20 mm from the bottle's bottom. This is important since, as in contrast to aqueous KOH, the developing potassium carbonates formed from atmospheric CO_2 are nearly insoluble in alcohol and therefore some crystals always accumulate on the bottle's bottom.

Additionally, we were recommended to use a soda lime-filled drying tube in order to minimize the formation of carbonates and the consequential annoying degradation of the solutions from the outset.

An initial difficulty was that crystals ended up in the filling valve or dispensing valve, causing these to leak – a problem with all ball valves. After rinsing with diluted hydrochloric acid (approx. 3 %), the instrument was again ready for immediate use. In addition to the points mentioned above, switching to commercially prepared titration solutions also helped to prevent this.

It is also recommended to clean the dispensing cylinder regularly. When the PTFE piston is moved downwards, small amounts of the medium inevitably remain on the cylinder wall. The solvent evaporates immediately, and carbonate crystals form and accumulate at the upper end of the glass cylinder. In order to avoid premature wear of the PTFE piston, the crystals have to be removed approximately every four weeks. After modifying our operating procedure as described above and refilling the dispensing cylinder immediately after each titration, the forming of crystals was substantially reduced and the cleaning cycle could be extended to approximately 12 weeks.

By now, the instruments have been in use for almost one year, and it appears as though the piston/cylinder assembly can last for one year and possibly longer with regular cleaning, even with this difficult titration medium. Whenever necessary we can simply replace the piston and cylinder ourselves.

All in all, compared to the previous model as well as to glass burettes, the new Titrette saves a great deal of time, since cleaning can be done much faster and easier than before.

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