

Determination of pH in carbon black

Fast, accurate pH measurement in carbon black for battery cathodes according to ASTM D1512, ISO 787-9, and GB/T 1717

Conductive carbon black is an essential additive in modern lithium-ion batteries. It is used as an ingredient in the cathode and forms a conductive chemical structure that ensures that non-conductive materials (e.g., lithium nickel manganese cobalt oxides) are electrically connected to each other and to the current collector. Without conductive carbon black, no electrical current would flow, and the battery cell would not work. It is therefore essential to confirm the properties and quality of carbon black. In

this respect, the pH value is among the first easy-to-check parameters.

However, in order to determine the correct pH value, both the method and the measuring equipment must meet the highest quality standards.

In this Application Note, the pH value in carbon black is accurately and reliably analyzed by using a 913 pH Meter equipped with a pH electrode according to ASTM D1512 as well as ISO 787-9 and GB/T 1717.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on carbon black used as a conductive additive cathode material.

Sample preparation is not required.

EXPERIMENTAL

The pH values are carried out using a 913 pH Meter equipped with a pre-calibrated Unitrode easyClean (Figures 1 and 2).

To create the cathode slurry, an appropriate amount

of sample is weighed into the sample beaker, and deionized water plus an organic solvent as wetting agent (according to the standards) are added. Afterwards, the cathode slurry pH is determined.



Figure 1. 913 pH Meter from Metrohm.



Figure 2. Unitrode easyClean with Pt1000 temperature sensor

RESULTS

This method offers very accurate results, as shown in Tables 1 and 2.

Table 1. Results of the pH measurement of carbon black according to ASTM D1512 (n = 6).

Sample (n = 6)	pH value	Temperature in °C
Mean	8.62	24.3
SD(abs)	0.01	0.1
SD(rel) in %	0.1	0.2

Table 2. Results of the pH measurement of carbon black according to ISO 787-9 and GB/T 1717 (n = 6).

Sample (n = 6)	pH value	Temperature in °C
Mean	8.00	24.9
SD(abs)	0.02	0.1
SD(rel) in %	0.2	0.3

CONCLUSION

The 913 pH Meter equipped with the Unitrode easyClean is an excellent combination to measure pH in cathode materials.

This setup is inexpensive, user-friendly, and takes up

minimal bench space. Furthermore, as the name indicates, the easyClean diaphragm of the Unitrode can be easily cleaned even in the case of heavily contaminating samples like carbon black.

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CONFIGURATION



913 pH Meter, modèle de laboratoire

Appareil de mesure du pH bicanal portable pour mesurer le pH / la tension en mV et la température. Avec cet appareil de mesure fonctionnant sur batterie et sa plaque de potence, vous êtes parfaitement équipé pour des mesures sur le terrain et en laboratoire.

- pH-mètre portable avec jeu de batteries incorporé et deux entrées de mesure du pH isolées électriquement.
- Entrée de mesure du pH analogique pour des électrodes pH standard de Metrohm
- Entrée de mesure du pH numérique pour des électrodes pH intelligentes de Metrohm
- Boîtier robuste, étanche à l'eau et à la poussière (IP67), idéal pour une utilisation dans des conditions difficiles en extérieur et en laboratoire
- Écran d'affichage couleur à LCD rétro-éclairé pour une lecture facile des résultats
- Interface USB pour une exportation aisée des données sur ordinateur ou imprimante
- Mémoire interne de grande capacité (10 000 blocs de données)
- Modes utilisateur et expert protégés par PIN afin d'éviter toute modification accidentelle des paramètres
- Impression et exportation des données conformes aux BPL avec ID utilisateur et horodatage