The Use of Indium Chemicals in Alkaline Battery Manufacturing

APPLICATION NOTE

Indium is commonly used in the manufacture of alkaline batteries. Indium functions by coating the individual zinc particles of the cathode with a thin coating of indium metal. When the battery is under electrical load (discharging) the indium coating controls the zinc reaction and results in uniform zinc metal dissolution during the reaction. This improves battery efficiency, adds lifetime to the battery, reduces outgassing, and protects the battery from rupture. The only alternative materials available are Hg and Cd, both of which are highly toxic and have been banned for use in batteries in most countries.

Indium is used primarily used as an indium chemical in the potassium hydroxide electrolyte, but the metal can also be alloyed with the zinc powder at approximately 500 ppm and plated on the brass anode collector pin.

Indium chemicals for use in the potassium hydroxide electrolyte fall into two classifications, soluble and insoluble. Soluble chemicals include indium trichloride and indium sulfate. When solutions of these chemicals are added to the electrolyte they react with the potassium hydroxide and form extremely fine particles of indium hydroxide *in-situ*. Insoluble chemicals include indium hydroxide, indium oxide, and indium acetate. These chemicals are added to the electrolyte and do not react with the potassium hydroxide. All variations are used by various alkaline battery manufacturers, and the specific chemical is usually proprietary to a given battery manufacturer. In the case of insoluble indium chemicals it is important to use a very fine particle size. The smaller the particle size, the larger the surface area there is available for the chemical reaction. Hence the particle size controls the speed of the reaction.

Since power is time dependent, the battery that has the faster reaction time can generate the higher power.

Therefore, we recommend that battery companies using our indium oxide chemicals choose the smaller particle size of Type B powder (primary particles range from 0.1 to 1.0 µm in diameter; agglomerates size up to approximately 6 µm) for faster reaction times and, ultimately, more power.

For more information about battery chemistry and indium chemicals, please contact technical support engineers:

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铟化学品在碱性电池生产中的应用

碱性电池生产中常常使用铟。铟通过对带有一层薄薄铟金属涂层的阴极锌粒进行涂敷来发挥作用。当电池电力负载过轻（放电）时，铟涂层可控制锌反应，并在反应过程中产生均匀的锌金属溶解。这可改进电池效率、延长电池使用寿命、减少排气，并保护电池免受损坏。唯一的可替代材料是汞和镉，但他们毒性强，因此被大多数国家禁止在电池中使用。

铟主要用作氢氧化钾电解质中的铟化学品，但能以大约 500 ppm 的比例与锌粉形成合金，可涂覆于铜阳极集电极引脚。

用于氢氧化钾电解质中的铟化学品可分为两类：可溶解和不可溶解。可溶化学品包括三氯化铟和硫酸铟。当这些化学品溶液被添加到电解质中，它们便会与氢氧化钾发生反应，并形成极细的氢氧化铟颗粒。不可溶化学品包括氢氧化铟、氧化铟和醋酸铟，它们被添加到电解质后不会与氢氧化钾发生反应。所有变量均被各碱性电池制造商所使用，且特定化学品通常为某电池制造商专利。对于不可溶铟化学品，使用极细的微粒十分重要。颗粒尺寸越小，发生化学反应的表面积就越大。因此，颗粒尺寸决定反应速度。

由于电量因时间而异，故反应速度越快的电池可产生更高的电量。

因此，我们建议电池制造商使用我们的氧化铟化学品，选用颗粒尺寸较小的 B 类粉（颗粒直径主要在 0.1 微米到 1.0 微米之间，附聚物大小高达约 6 微米），以实现更快的反应速度，从而产生更多电量。

有关电池化学性质和铟化学品详情，请联系以下技术支持工程师：

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