The charge collector (a metallic mesh) is incorporated into the structure of the electrode by pressing it in with the web of catalyst. The electrode is removed from the felt and further dried by using a drum dryer and hot air. Remaining traces of surfactant can be removed using a spray of solvent. Finally, the electrode material so produced can be cut or rolled as desired. The proposed system is able to control electrode properties such as porosity, catalyst loading and thickness.

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Classification and characterisation of primary batteries
Part 1: Standardised conditions for the experimental determination of performance characteristics

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Performance characteristics that are addressed in this poster refer essentially to energy content, capacity, discharge voltage, time of discharge, internal resistance and more specifically to standard conditions under which these values are obtained.

The need for relevant standard conditions becomes obvious when studying the technical literature on primary batteries — including technical handbooks and data sheets of manufacturers. It appears that the experimental conditions for product characterisation are differing, thus the performance comparision for a given battery is not always based on the same grounds. In order to permit battery comparison, the IEC (International Electrotechnical Commission) has introduced standardised application and/or service output-tests [1], the results of which are given in terms of discharge durations. An IEC method for the determination of a primary battery's capacity, energy content and load capability is not available yet.

The intent of this poster is to propose a standard method that deals with the above deficiencies — it is based on the so-called standard discharge voltage, which only depends on the electrochemical system and not on the size of the battery, nor on its internal construction. The experimental determination of the standard discharge voltage for a given electrochemical system is obtained via a capacity/discharge resistance curve (C/R-plot) by employing a method to be presented.

It actually is the mean discharge voltage, determined from the discharge curve, that yields 98% of the maximum capacity C(max). The C(max) value is characterized by a capacity plateau, i.e: $dC/dR = 0$. The standard method furthermore permits us to address and quantify terms like energy content, capacity and time of discharge When introducing load resistance R(C/2), that yields half the capacity, it is possible to also address the battery's rate capability under standardized conditions.

When doing so, vague terms like *high rate* or *low rate* in relation to the specific power output P* of batteries may be replaced by an experimental value. Values of presently standardized primary batteries were determined to be within a range of $3\ \text{mW cm}^{-3} \leq p^* \leq 380\ \text{mW cm}^{-3}$.

To prove the validity of this approach, more than ten different systems (aqueous and non-aqueous) as well as different battery constructions were analysed.

From future work it is expected that the above method may be also employed to characterize secondary batteries.

Reference

[1] *IEC Publication 96, part 2*, IEC Central Office, 3 rue de Varambé, CH-1211 Geneva 20, Switzerland.

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Classification and characterisation of primary batteries
Part 2: System and performance characteristics and their application to matters of safety and nomenclature

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1. Application to matters of safety

The approach discussed in Part 1 (Poster 21) of this presentation is helpful in solving existing issues of International Standardisation in the attempt to provide Safety Standards to the public.

One of the issues is the question of electrical interchangeability of batteries having the same physical envelope and identical terminal arrangements, but however, exhibiting markedly different voltages. Reference is made, for example, to 3 V lithium batteries being physically interchangeable with 1.5 V batteries. They never will be standardised by the I.E.C. due to safety reasons.

Two voltage ranges have been defined so far. A formula was derived to describe these ranges. *Voltage range I* encompasses a range from 1.19 V/cell to 1.61 V/cell, *Voltage range II* encompasses a range from 2.3 V/cell to 3.65 V/cell. Within each voltage range, batteries may be manufactured to be physically interchangeable (identical physical envelope and terminal arrangements). For Safety reasons the physical envelope and terminal arrangements of batteries belonging to *range I* must differ from those of *range II* to meet the requirements for standardisation.