



New battery from used cells

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Introduction

Battery-powered electrical equipment, such as laptops and electric vehicles, are versatile and in some cases can reduce pollutant emissions, contributing to sustainability. The problem, however, is battery disposal [1, 2].

A lithium battery, the type most commonly used today, is made up of several cells connected via series and parallel connections to the battery management system (BMS) board (see Fig. 1).



Fig. 1: Bateria de laptop

When a battery like the one in Fig. (1a) is discarded, not all of its cells, Fig. (1b), are out of service. There are cases in which only one cell is out of order or, sometimes, only the BMS.

Objective

The aim of this work is to check how many 18650 cells are still in usable condition in a batch of discarded laptop batteries.

Materials and Methods

In this study, 138 laptop batteries, such as the one in Fig. (1a), were dismantled, which resulted in 777 cells of 65 mm high and 18 mm in diameter, 18650 cells, see Fig. (2).

These cells were tested and during this test the amount of charge (Q), temperature, internal resistance, charge and discharge current, etc., were monitored [3].



Fig. 2: Single cells.

Results

It was noted that the charge capacity criterion is very robust, since cells that showed overheating ($> 50\text{ }^{\circ}\text{C}$), high internal resistance or another parameter that condemned it, also showed low charge capacity (Q).

For this reason, the $Q \geq 2000\text{mAh}$ criterion was used to select cells as useful.

With this criterion, 396 cells (18650) were considered suitable for use, i.e. 51% of the total number of cells tested.

These used cells were used to build a battery which, while serving another research project, is tested for durability, see Fig. (3).

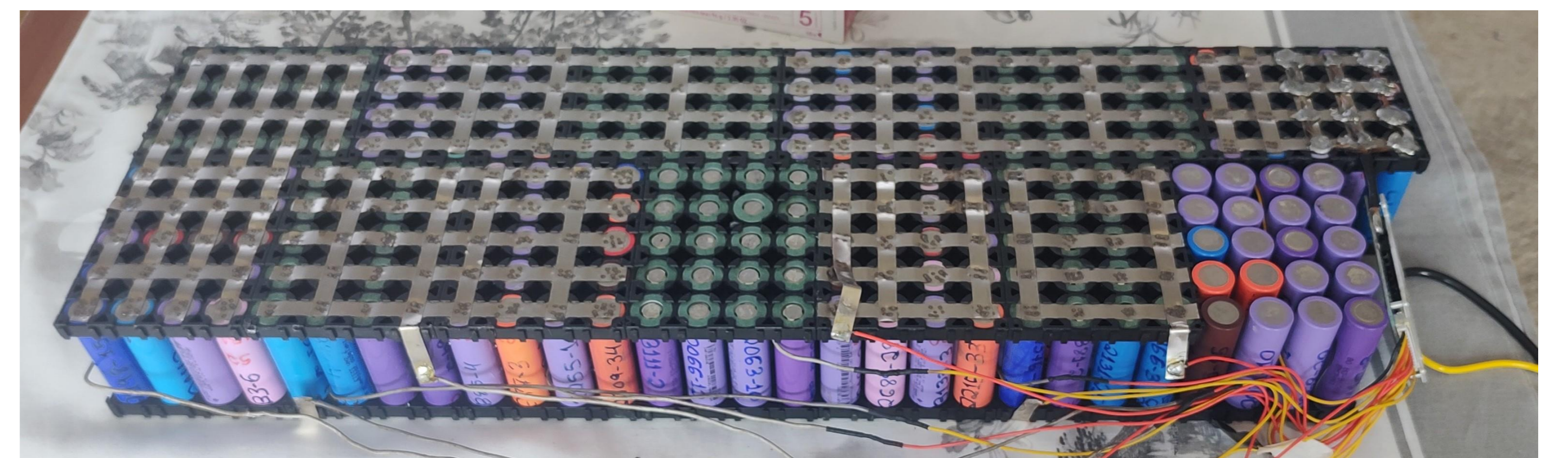


Fig. 3: The new battery

Concluding remarks

Although it is not the only relevant parameter, the amount of charge a cell can receive is a robust criterion ($Q \geq 2000\text{mAh}$) in assessing the quality of the cell used.

Many of the 18650 cells currently on the market have a $Q < 2000\text{mAh}$ even when new, so the criterion used in this work selects cells that are better than many new cells.

If the durability of the "new" battery is confirmed, the results of this work could bring great environmental gains.

References

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