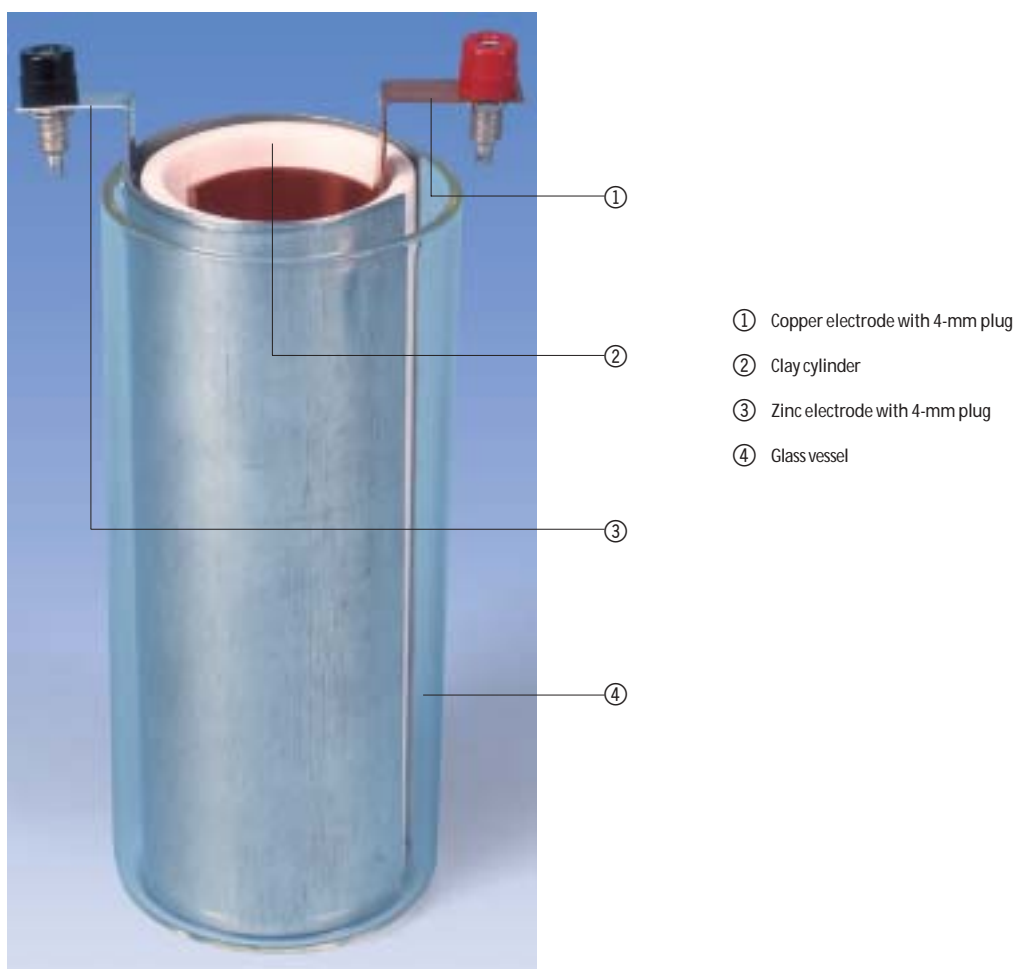


Daniell cell U14331

Instruction sheet

8/05 ALF



The Daniell cell is used for investigating the properties of an electrochemical cell.

1. Safety instructions

- Caution! Heavy metal salts are toxic.
- Safety goggles are a must when working with acids or bases.
- Students must always be thoroughly informed about the hazards of the chemicals used.
- Leaking fluid can cause permanent stains and holes in clothing.

- The apparatus must be thoroughly cleaned after the experiment.
- Current regulations must be strictly adhered to when disposing of the chemicals.

2. Description, technical data

The Daniell cell, named after John Frederic Daniell, is a galvanic cell consisting of two cylindrical electrodes (zinc and copper) in a glass vessel. The electrodes are separated from one another by a clay cylinder.

Dimensions: 105 mm high, 65 mm Ø
 Connections: via 4-mm plugs
 Appropriate filling: Copper sulphate solution (CuSO₄), 10%,
 Zinc sulphate solution (ZnSO₄), 10%

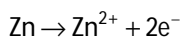
2.1 Scope of delivery

- 1 Glass vessel
- 1 Clay cylinder
- 1 Copper electrode with plug
- 1 Zinc electrode with plug

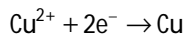
3. Theory

The combination of two half-cells for the purpose of converting chemical energy into electrical energy is called a galvanic cell. In a Daniell cell, a copper electrode with a copper sulphate solution is situated in one half-cell and a zinc electrode with a zinc sulphate solution is found in the second. In galvanic cells, the baser metal of the two always forms the negative pole. In this case, the electrons thus flow from zinc to copper. The zinc electrode is dissolved over a period of time, while metal copper settles on the copper rod. The inner conduction is carried out by the negative sulphate ions which can pass the wall of the clay cylinder. Current drain is completed either when the zinc electrode is dissolved or when the copper sulphate solution has been used up. The following reactions can be appreciated:

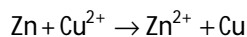
Oxidation:



Reduction:



Redox reaction:



Theoretically, the Daniell cell provides a current of 1.1 V. However, the measured reading, as a rule, is always slightly below the theoretical value.

4. Operation

- Before the start of the experiment, prepare a sufficient amount of the electrolyte solutions.
- For preparing one litre of 1-molar copper sulphate solution, take 249.5 g CuSO₄ and add distilled water till you get one litre of solution.
- For preparing one litre of 1-molar zinc sulphate solution, take 287.4 g ZnSO₄ and add distilled water till you get one litre of solution.
- For preparing a 0.1-molar solution, only take 1/10th of the specified quantities.
- Pour the solutions into the corresponding half-cells.
- Measure the current generated with a voltmeter.
- The experiment can also be repeated with a 1-molar copper sulphate and zinc sulphate solution.
- The apparatus and electrodes must be thoroughly cleaned immediately after the experiment.
- Chemicals which cannot be reused must be stored in special vessels and disposed of in an orderly fashion afterwards, strictly adhering to current regulations.

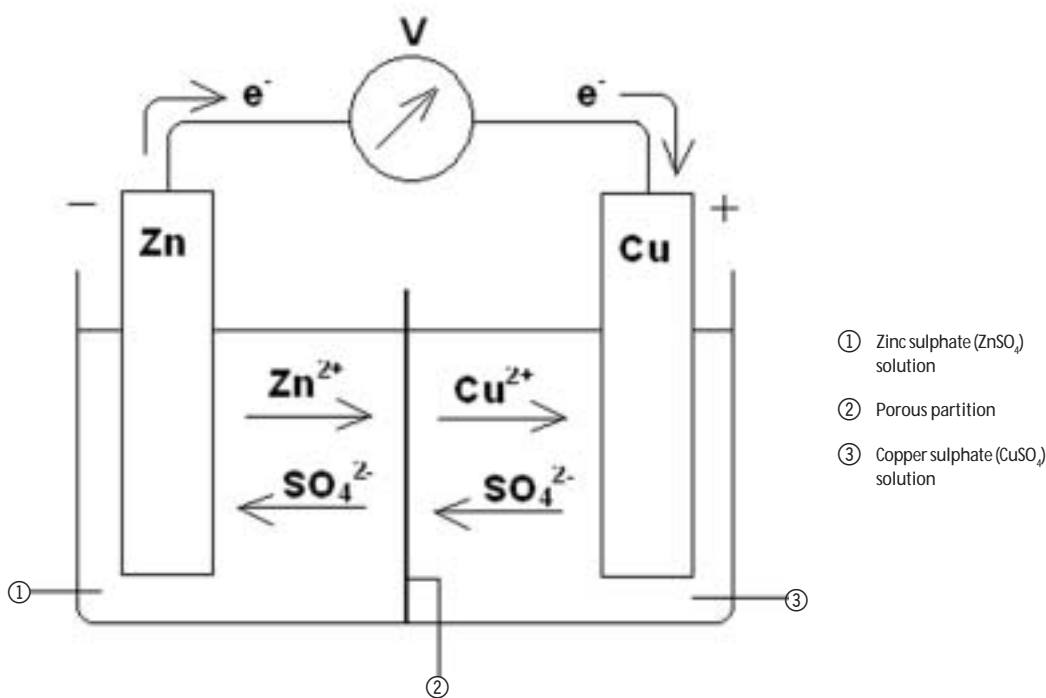


Fig. 1: Daniell-Element