Rolled Foils in Batteries

Product information

For many years SCHLENK has specialized in the production of the thinnest metal foils with a wide variety of possible surface treatments and supply formats. SCHLENK has supplied copper and nickel foils to battery manufacturers for over 20 years and, since 1998, has used special coating processes and families of electrolytes that have been under continuous development to produce metal foils with functional layers.

Using Foils in Batteries

... As current collector
- Very thin copper foils
- Plain surface with different surface qualities (standard and enhanced degreasing)
- Silver and Nickel foils for special batteries

... For tabbing
- Slit to narrow width
- Plain Nickel or Copper foils
- Plated or clad foils
HIGH TENSILE COPPER FOILS

Foils with elevated strength and improved conductivity

- Battery manufacturers call for higher mechanical durability and cycle stability in electrode materials
- ED foil is limited in Rm (below standard RA foil)
- **SCHLENK High Tensile Copper Alloys** with elevated tensile strength (Rm) improved conductivity (% IACS)
- New approach for battery applications with ultimate requirements on copper anode materials
- High Tensile Anode Foils available on stock in 10 microns as **Battery Foil Sample Kit**. For further information please visit our website: www.schlenk.com

Technical differences between RA and ED foils

RA foils are manufactured by a rolling process. The copper is cast in blocks and rolled to gauge in coils. ED foils are manufactured by a galvanic process. The copper is deposited on a rotating drum by an electric current. RA foils offer unique material characteristics and are used in applications of highest material requirements.

<table>
<thead>
<tr>
<th>Technical Differences</th>
<th>RA foil</th>
<th>ED foil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surfaces</strong></td>
<td>Homogeneous, plain (rough possible)</td>
<td>2 different sides (1x rough and 1x plain)</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>relatively high</td>
<td>relatively low</td>
</tr>
<tr>
<td><strong>Manufacturing process/cost</strong></td>
<td>complex/relatively high</td>
<td>simple/relatively low</td>
</tr>
<tr>
<td><strong>Available alloys</strong></td>
<td>nearly no limitations, all alloys can be rolled</td>
<td>not possible, only pure metals can be deposited</td>
</tr>
<tr>
<td><strong>Grain structure</strong></td>
<td>Horizontal orientation</td>
<td>Vertical orientation</td>
</tr>
</tbody>
</table>

Consideration for using rolled foils:

Rolled Foils by SCHLENK offer a variety of unique characteristics compared to Electrodeposited Foils (ED) and are ideal for use in advanced battery applications.

- Many different alloys available
- Excellent mechanical stability at elevated temperatures
- High flexibility, even under extreme conditions
- High conductivity for high power applications
- Different surface qualities (standard and enhanced degreasing)
- Clean surfaces without oxides and oil
Competencies

- Rolling:
  Wide, ultra-thin, different materials
- Slitting:
  Narrow, thin, precise
- Surface upgradings:
  Degreasing, roll cladding
  single or double-sided

Materials

- Copper, Silver, Nickel and their alloys
- Thickness: 0.006 mm – 0.400 mm resp. 0.00024“ – 0.016“
- Width: 0.6 mm – 650 mm resp. 0.024“ – 25.6“

Forms of delivery

- Different core sizes
- Steel, cardboard or plastic core
- Spools / plastic cores with side-shields

Individually tailored deliveries

- Small lots for R+D
- Large lots for mass production
- Complete container loads

Summary

- RA foils made from high purity copper grades
- Different alloys available with distinct features
- Available for testing with SCHLENK Battery Sample Kit
- Optional coating on one or both sides available
- Experienced application engineering team
- Well equipped laboratories including Scanning Electron Microscope (SEM)
- Close cooperation with leading research institutes and R+D departments

Data in this publication is based on careful investigations and is intended for information only. All information shall not be binding, shall carry no warranty as to certain ingredients, as to the fitting for a special purpose, as to the merchantability, or as to the industrial property rights of third parties. Any and all users are obliged to carry out tests on their own authority as well as to check the suitability and the danger of the respective product for a particular application. SCHLENK assumes no liability in this regard; neither to the exactness nor to the completeness of the data. We apply our General Sales Conditions to be found on www.schlenk.com.

Printed in Germany, CS 8/2020