

Measurements of industrial components for Lodam electronics a/s

LODAM is a global player within intelligent electronics for heating, ventilation, air conditioning and refrigeration located in the Region of Southern Denmark. Since many years the company collaborates successfully with the University of Southern Denmark as a regional partner for education and research.



“The cooperation with the Mads Clausen Institute was very helpful for us. After receiving the report of the measurements, we have decided to vary the manufacturing method and further discussed alternative coatings for the busbars to protect them from corrosion while maintaining a high conductivity in the contact surfaces.”

Álvaro Soler Verdú, Lodam electronics A/S

Challenges and Need

The scope of this analytical research was to identify fibers present on metallic plates causing equipment failure. In order to identify the fibers and obtain detailed information, Scanning Electron Microscopy (SEM) imaging was proposed as the best solution as it provides high quality images. In addition Electron

Diffraction Spectroscopy (EDX) measurements were performed for the quantification of the fiber material.

The company wishes to visualize those fibers, the material they are composed of and to find the root cause of the fiber formation.

Services

The Mads Clausen Institute carried out the proposed SEM and EDX measurements. The equipment used is a SEM Hitachi S-4800 with a Bruker EDX add-on able to provide directly high resolution images and EDX spectra for material quantification.

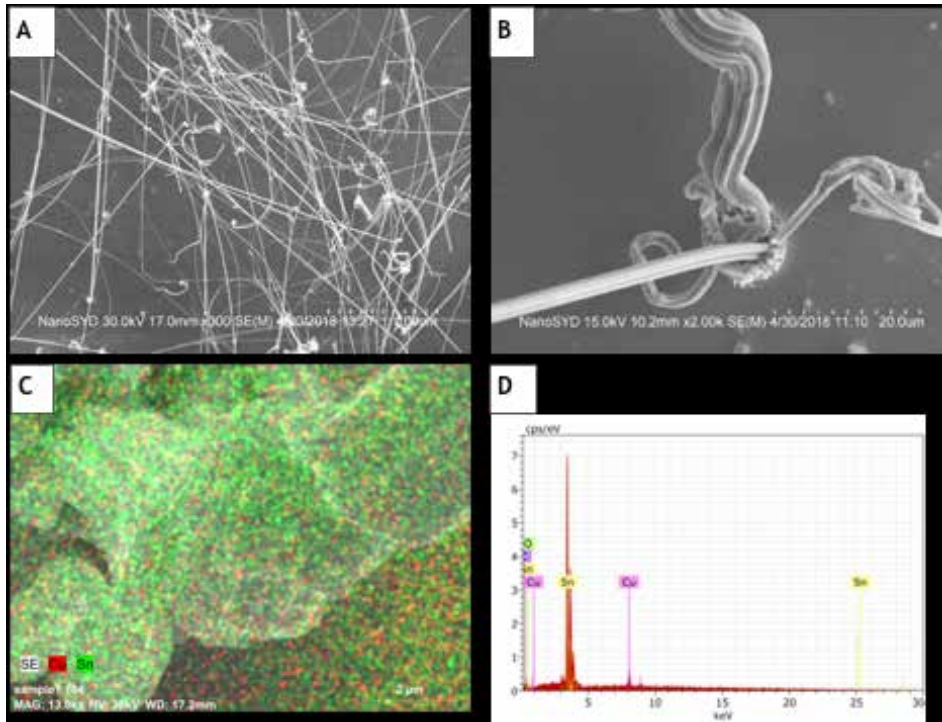


Figure 1. SEM of fiber network present on the surface of a sample (A). Zoom in on a formation site of a fiber, indicating fiber formation from the underlying layer (B). EDX element mapping of a fiber on a surface (C) and the relevant spectra (D).

Results

SEM imaging revealed the presence of a complex fiber network located on the surface of the samples (Figure 1.A). The fibers are formed from the underlying surface, break through defects sites and grow upwards (Figure 1.B) creating a conducting fiber mesh network that can generate short circuits. EDX analysis indicates that the fibers are mainly consisting of Sn with traces of Cu (Figure 1.C and D). As the top layer does not consist of any Cu the analysis led to the conclusion that the fiber network is formed from stresses in the underlying layers. This conclusion is in agreement with literature, where it has been shown that in the electroplating process for the formation of Sn-Cu-Sn layer, residual stresses

from electroplating, mechanically and thermally induced stresses lead to the formation of fibers known as whiskers in literature.

Contact

Prof. Dr. Horst-Günter Rubahn
 Head of department
 Mads Clausen Institute
 University of Southern Denmark
 Alsion 2
 DK-6400 Sønderborg
 Phone: +45 6011 3517
 rubahn@mci.sdu.dk

