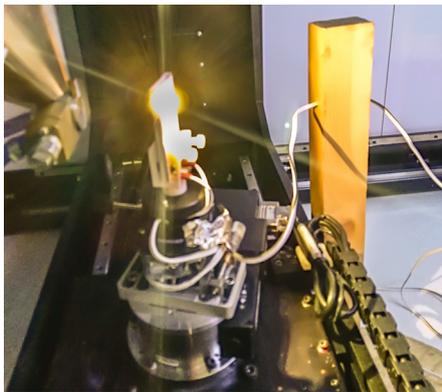


Studying shining LED lights

LED iBond is a Danish company that develops especially thin LED platforms which, due to their slim design, are suited for a wide range of custom-tailored applications. In contrast to conventional LED lighting solutions, LED iBond invented a “sandwich” system in which the LED is placed between two aluminium plates in one composite panel, which ultimately allows for LED lighting panels that are only 6 mm thick. In order to develop their LED solutions further, the company is interested in understanding the influence of temperature on the internal geometry of the LED sandwich construction. This requires non-destructive *in situ* testing of the device. Therefore, the company engaged with the 3D Imaging Center at DTU to perform X-ray computed tomography measurements with and without running the LED. The work was carried out as an outreach project within the LINX project, which enables companies to test X-ray and neutron based characterization techniques.



Panel with LED lights from LEDiBond.



In situ measurement setup showing the running LED “sandwich” within the X-ray CT equipment.



Overlaid volume rendering of the operating (grey) and turned off (orange) LED sandwich, a) from the outside and b) cut in the center.

Challenge

X-ray Computed Tomography (CT) is a technique in which a 3D representation of the studied sample is obtained after the sample is X-rayed from different angles. Therefore, it allows to study materials non-destructively under operating conditions. In order to picture the effects of the temperature increase due to the LED being lit, the LED has to be operating during the CT acquisition. This requires enough space on the inside of the X-ray equipment, a connection to a power supply and a sample holder which keeps the area of interest inside the X-ray beam without other parts moving into the field of view.

Collaboration

Through the collaboration between LED iBond and the 3D Imaging Center at DTU, the material was characterized using in-house micro X-ray computed tomography. This collaboration was part of the LINX project, in which researchers at leading Danish universities collaborate with scientists in industry to solve industry-relevant problems using advanced neutron and X-ray techniques. Besides projects for the members of the LINX association, the LINX project also supports outreach projects for companies which are not members of the LINX association. In this way, new companies can test how they can profit from X-ray- and neutron-based techniques.

Results

In situ measurements were performed using a commercial Nikon XT H 225 X-ray tomography setup which has a large sample chamber and allows to place a power supply inside the chamber. The same measurements were carried with a running LED and after turning it off. For quantitative analysis, the upper parts of the sandwich structure were overlaid, such that differences in the more flexible parts could be studied. A finding was that the distance between the upper and lower part, which are connected by a spring, is enhanced when the light is turned on, as pointed to by arrows. This can be explained by thermal expansion. Moreover, the non-destructive measurements allow to also quantify these differences, when the same material is compared under operating and non-operating conditions.

Imaging Industry Portal

The Imaging Industry Portal is a part of the 3D Imaging Center at DTU and assists companies in using and implementing 3D Imaging in research, development and production. The portal offers research-based 3D Imaging services and provides companies with the latest equipment and the most advanced knowledge within 3D Imaging and data analysis. The Imaging Industry Portal works as a gateway to ESS and MAX IV, as well as other large scale facilities.

www.imaging.dtu.dk/english/Industry-Portal

DTU 3D Imaging Center

