

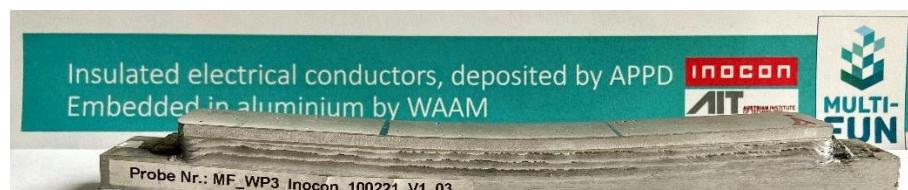


INOCON and LKR are investigating the fully embedded copper conductors in aluminium substrate

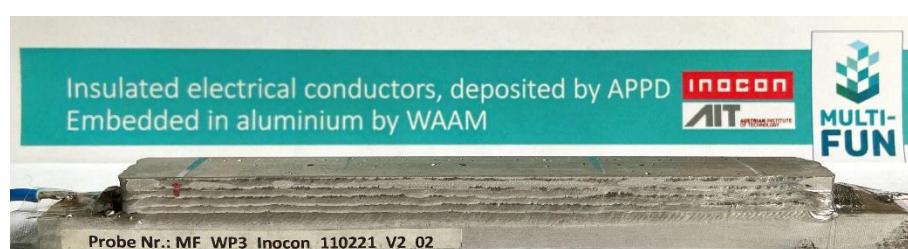
Several MULTI-FUN partners are developing technologies for a multi-material combinations of **2 or more different materials**, using different **directed energy deposition (DED)** technologies. In this case, at first a special metal spray technology called **InoCoat** is applied to **deposit a layer of Aluminium oxide on top of a standard aluminium alloy bar**, covering the metal in the middle area for electrical insulation reasons. The same atmospheric plasma powder deposition process is then applied to manufacture a central track of **copper**. This conductive area along the full specimen's length is afterwards covered with Aluminium oxide.

This setup is then covered by several layers of conventional aluminium alloys by **wire+arc additive manufacturing (WAAM)**, fully embedding the sandwich of electrically insulation and conductive materials, respectively. So, a **multi-material design incorporating 3 different material** is realized. After machining the samples to a symmetric geometry with the special materials layer in the middle, they were introduced to a 4-point-bending test procedure.

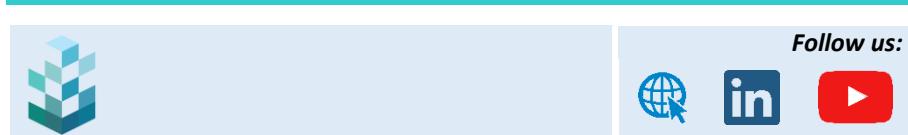
During this elasto-plastic deformation, the electric resistivity was continuously measured using a milliohm-meter device, showing that the Ohm values were scattering less than 1% compared to the static (as built) values. Even a reverse deformation of one already bent sample back to a flat shape did not harm the conductivity, still showing the original resistivity within <1% scatter. These investigations are directly related to the planned multi-functionality of Demonstrator 4 ("dashboard carrier" out of Aluminium), but analogously relevant for Demonstrator 3 ("see-through a-pillar").



Picture above showing a test sample after 4-point-bending test, exhibiting a plastic deformation of appr. 3,5 mm, but no significant change in Ohmic resistivity of the embedded copper layer



Picture above showing a test sample, at first bent to appr. 3,5 mm deflection, then straightened again by reverse bending, still showing no significant change in Ohmic resistivity of the embedded copper layer during the plastic forming.



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