Printed intelligence, from 2D to 3D printing processes on metallic objects, and under severe environment: smart coating functions dedicated to digitalization, the Internet of Things (IoT), electronics, energy and aerospace application

N. Pavlovic, Ph. Guaino, M. Karuppasamy, J. Forterre, F. Duminica, A. Daniel, C. Archambeau

AC&CS – CRM GROUP,
Allée de l'Innovation 1,
B - 4000 Liege (Belgium)

Printed electronic in combination with advanced material development pursues mega trends with new markets and businesses for flexible, stretchable and large area electronic. Most of these printed devices are currently integrated on plastic foils, papers and textiles. Nevertheless, metallic substrates appear to be also a promising alternative for several raisons. First, metal can overcome important arising technological difficulties due to the shortcomings durability, moisture barrier properties (particularly for organic material) and heat dissipation. Moreover, metal will allow very original smart applications in energy, IoT, building, appliance, automotive and aeronautics. Moreover, metal substrate has potential not only for 2D but also for 3D printing of electronic materials either by transforming already printed metallic system to final shapes or by direct 3D writing function on the surface of the object.

Recently CRM group, Research Center in Metallurgy located in Belgium, has initiated a Shapetronics democase, printed electronic functions on 3D metal objects, as part of the New Nano-Enabled Products pilot of the Vanguard Initiative. Shapetronics concept would have as objectives to regroup a "platform 3D tools " in which several 3D printed electronics processes would be available. Their applications are intended under severe conditions, like corrosion, abrasion, high temperature, etc. Opportunities especially arise in the areas of automotive and aeronautics who are believed to benefit the most from developments in the area of printed electronics on curved surfaces. For application under sever environment these smart systems must be elaborated from robust materials, or protected by highly resistant coatings. This is possible to achieve using currently available technologies like 3D printing or thermal spray coating. However, development of new technologies for low cost 3D electronic deposition on large which are attractive for the industry remains a challenge. Thus, CRM group is interested in further development of shapetronic concept in partnership with other members as well as in creation of the platform, through the Vanguard Initiative and industrial players.