Advanced Nanoadditives: new opportunities in technical coatings

Ángel Yedra Martínez
Marina González-Barriuso, Carmen Manteca, Lucía Pérez-Gandarillas, Nuria Más Font

Centro Tecnológico CTC,
C/Isabel Torres, 1, Santander, España

ayedra@centrotecnologicoctc.com

Currently, the potential challenge of the coating sector is the design and development of innovative coatings for a durable service lifetime in a wide range of applications, taking account environmental issues. Multifunctional coatings are expected to change this traditional coating industry through the achievement of high performance and simultaneous properties for high requirements applications. In particular, the development of advanced functional coatings based on nanotechnology is a field of study with a remarkable growth in the recent years [1].

The incorporation of different active nanofillers/nanoadditives into organic coatings can notably improve the final product performance. It is well-known by the scientific and industrial community the unique and excellent properties and the great potential of nanomaterials over a wide range of applications. The success of nanoparticles in comparison with macrometer-sized particles is linked to their size-related properties and large specific surface. However, an important challenge concerning the use of nanoparticles is their tendency to aggregate leading to a bad dispersion in the polymeric matrix. To solve this issue, surface functionalization of the nanoparticles allows the possibility of selectively "anchoring" different molecules/substances on the surface of the nanomaterials, improving the compatibility in the matrix and transferring new functionalities/ multifunctionalities such as barrier effect, wear resistance, hydrophobicity, anti-fouling, self-healing,… [2]. Therefore, the control, knowledge and manipulation of said surface has become vital and necessary to obtain new and improved nanomaterial functionalities in an optimal, technical and economically viable way.

Based on functionalized nanomaterials, CTC is developing specialized advanced nanoadditives for organic coatings, customized to promote several functionalities as barrier effect, hydrophobicity and self-healing simultaneously. These nanoadditives are based on two different platforms:

- Graphene and related materials (GRM)
- Metallic oxide nanoparticles

These new multifunctional nanoadditives have been integrated in coatings and evaluated under several characterization techniques. The new additives stand out for having a low environmental impact and high efficiency. With low load contents (<1%), excellent results are obtained (Fig. 1).

These developments will allow a significant impact on CTC, increasing its competences in the advanced additives field and coating market.

References

[1] Abdel Salam Hamdy Makhlouf, 2014. Handbook of Smart Coatings for Materials Protection, ELSEVIER, UK
[2] S. Kango et al, Progress in Polymer Science, 38 (2013) 1232– 1261

Figures

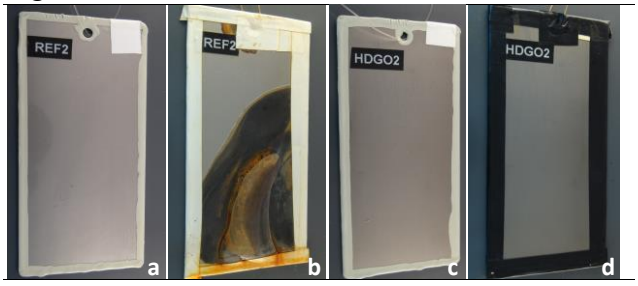

Figure 1: Representative image of a coated steel sample with a reference resin(a, b) and one with the resin containing a new nanoadditive developed in CTC (c and d) before and after 500 hours of salt spray test, respectively.