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Characterization of advanced technological material using X-ray techniques and SEM

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The constantly increasing demand for advanced products with improved performance and minimum thermal/energy/material waste alongside the fast emerging environmental challenges and the limited reliability and narrow life-cycle performance of old material systems greatly effect several areas of everyday life and economy. Thus, developing of advanced technological materials which satisfy the newly established technological standards is of great importance. The experimental procedure of optimizing and tuning the performance of a pre-existing or newly created material requires thorough testing of its properties to certify its usage and large scale production capability. In depth knowledge of the structural and chemical properties is considered the first step towards the understanding of the physical characteristics of a material and its potential usage. X-rays diffraction (XRD), X-ray Photoelectron Spectroscopy (XPS) and Scanning Electron Microscopy (SEM) are among the most used material characterization techniques enabling surface imaging, composition identification, elemental analysis, chemical state characterization, structural quality and homogeneity investigation, failure analysis, etc. In this work we present the XRD, XPS, EDX and SEM results obtained [1] for a wide range of advanced technological materials, such as polymer nanocomposites, thermoelectrics, zeolites, biomaterials, etc. Results analysis indicated the importance of these complementary techniques in the thorough characterization of the material properties and failure points making them a useful tool in the research process and manufacturing.

References

1. <http://amdelab.physics.auth.gr/char-structure-en.htm>

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