

2nd Workshop « 3D Microtexture analysis »

LEM3 - Labex DAMAS

Metz, October 13-15, 2015

Understanding microstructure formation by 3D analysis in the micro, nano and atomic scale

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3D microstructure characterization plays a key role for the *quantitative* understanding of the relationship between processing, microstructure and properties of high performing materials. However, it could not be fully exploited so far due to the lack of adequate 3D characterization techniques in some of the relevant scales. Recent progress in tomographic techniques has led to quantitative insights into the evolution of materials microstructures with gradual field of view sizes. We present hierarchical investigations for complex microstructure morphologies e.g. of an important lightweight material for automobiles – the Al-Si alloys. The interdendritic Al-Si eutectic network with its 3D shape and arrangement plays an essential role for stiffness, toughness and strain at fracture. The eutectic seeding on the atomic scale [1], the microstructural growth mechanisms on the nano scale [2] as well as their stochastic effect in the micro scale on the macroscopic properties are still under discussion and the materials are potentially far away from being optimal.

- [1] J. Barrirero, M. Engstler and F. Muecklich, Light Met. 2013 (John Wiley & Sons, Inc., 2013). doi:10.1002/9781118663189
- [2] F. Lasagni, A. Lasagni, M. Engstler, H.P. Degischer and F. Muecklich, Nano-characterization of Cast Structures by FIB-Tomography., Adv. Eng. Mater. 10, 62–66 (2008).