CHARACTERIZATION OF METAL FOAMS WITH SYNCHROTRON-TOMOGRAPHY AND 3D IMAGE ANALYSIS

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Introducing metal foams to mass production requires in-depth knowledge of the processing parameters' and foaming materials' influence on the resulting foam structure. Tomographic synchrotron images contain 3D information of the investigated sample with high spatial as well as high material specific resolutions and, therefore, are the suitable, non-destructive testing method.

We analyze these data sets by means of 3D image analysis, mainly using algorithms which originate from stochastic geometry. The information within one image which belongs to different morphological objects (pores, particles etc.) is separated, delivering so-called Boolean images. Plain voxel counting then delivers size distributions, more complex algorithms like Euclidean distance transformation in combination with erosion, dilatation and the Euler number give a detailed view of the correlations and other characteristics.

Therefore, we can investigate the influence of the blowing agent's particle size distribution on the pore size distribution, draw conclusions if a correlation between pores and particles exists and are able to distinguish which physical effect determines the cell wall thickness.

First we focused on zinc foams as the interest in this foaming material is growing but scientific activities have been low so far. In opposite to aluminium foams a bimodal pore size distribution is found while the critical cell wall thickness stays the same, pointing towards hydrogen solubility playing an important role during the foaming process.

Aluminium foam is already in use for industrial applications but there the foaming process is still not completely controlled. Samples in comparable foaming stages are prepared, varying only the particle size distribution in order to investigate a possible coherence. Finally, we had a look at possible correlations between the pore structure and particles.