Method for the evaluation of automatic porosity detection for CT-data

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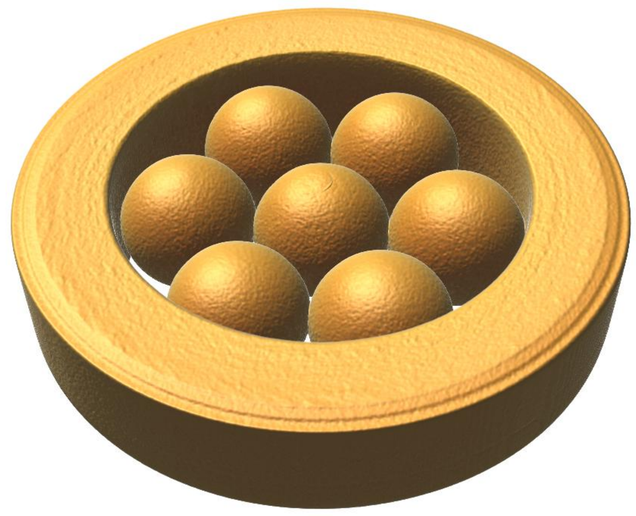
TASK

The evaluation of porosities within given component parts is a fundamental task in many industrial sectors. Very often such investigations need to be accomplished in a non-destructive way. Computed tomography provides the great advantage of accessing the full three-dimensional properties of the object under examination with non-destructive means.

The objective of this work is to present an innovative method to investigate the exactness of automatic porosity detection using well-defined reference bodies. This can be a great benefit for the experienced investigator to design a CT-scan appropriate to the particular task (expected pore sizes, required resolution, grey value contrast,…) or to estimate the accuracy of the data obtained from the semi-automatic porosity detections.



REALIZATION

Reference body: seven spheres located within a ring manufactured in high-precision. This enables the calculation of the exact porosity and with this an accurate reference for the porosity detection.

CT-Scans: varying voxel-sizes, varying grey-value contrast

Metallography: traditional method, reference for CT, 4 microsections

General: CT-scans realized with varying voxel-sizes, varying grey value contrast varying ratio voxel-size/pore size, varying conditions for porosity detections by varying contrast

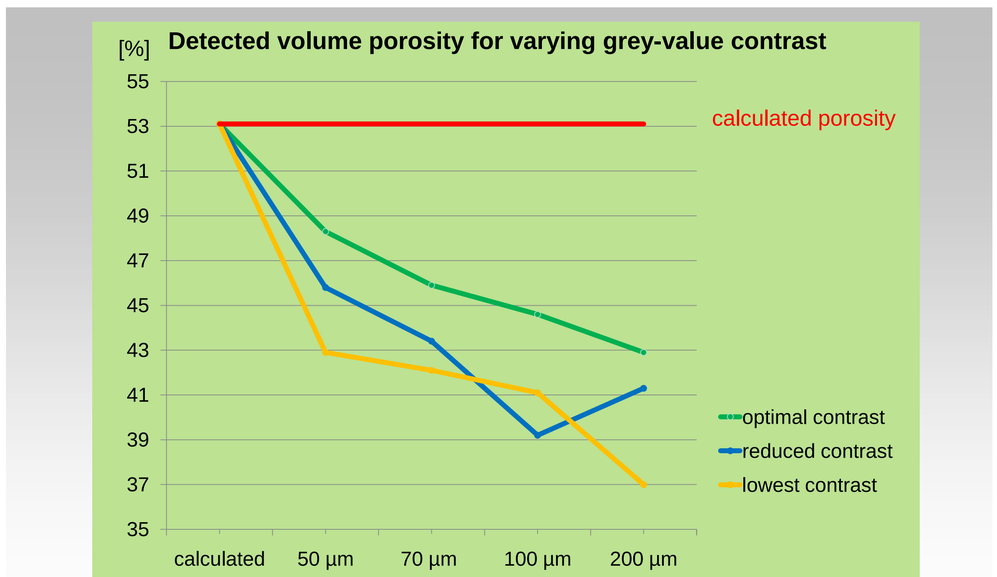


Figure 1: Volume porosity detected from CT-datasets with varying scan parameters.

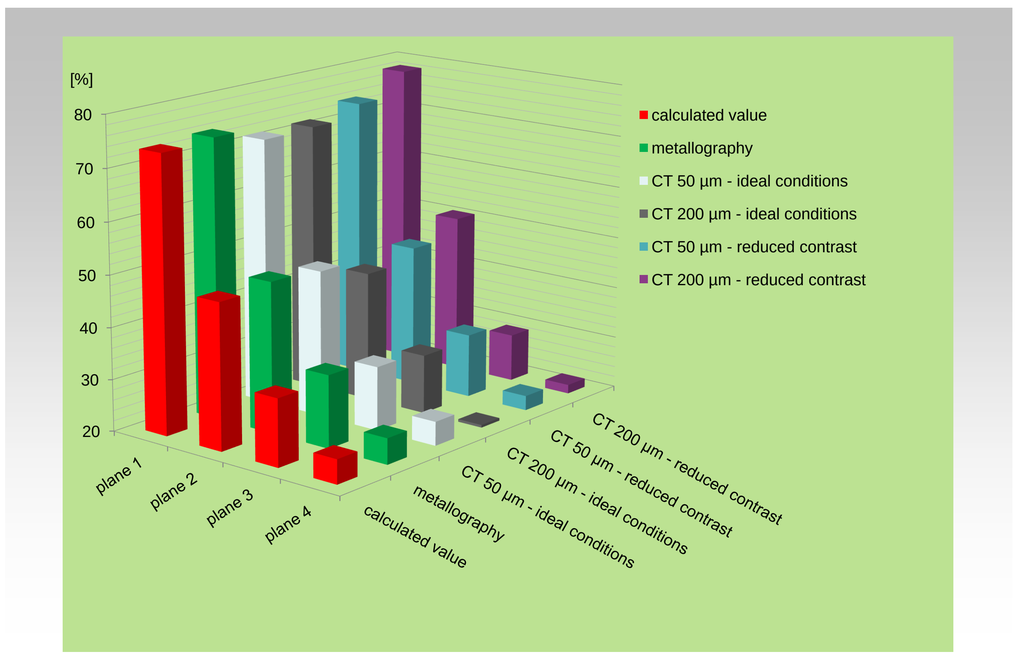


Figure 3: Comparison of metallographic evaluation, theoretical values and porosity detections from CT-data of four planes of the reference body.

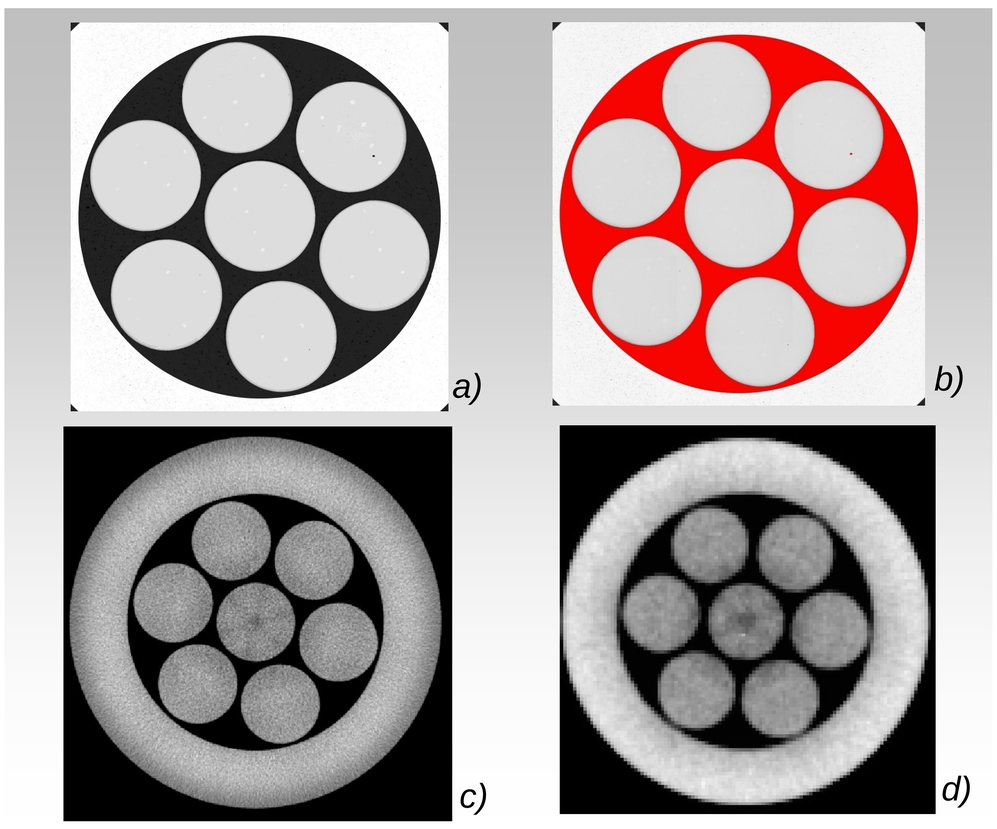


Figure 2: *a)* microsection of plane 3, *b)* porosity detection on plane 3, *c)* plane 3 from CT-dataset with 50 µm voxel-size, d) plane 3 from CT-dataset with 200 µm voxelsize.

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