

Quantification of the Hypoeutectic White Cast Iron Microstructure from Images Using Mathematical Morphology and an Artificial Neural Network

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This work presents a comparative analysis between two automatic methods to segment and quantify the microstructure of white cast iron from images. The comparative methods are the SVRNA (Microstructure Segmentation by Computational Vision using Artificial Neural Networks), developed during this work, and the Image Pro-Plus, a common tool used for material microstructure analysis.

In our SVRNA system, mathematical morphology algorithms are used to segment the microstructure elements of the white cast iron, which are then identified and quantified by an artificial neural network. The development of a new computational system was necessary because the usual commercial software, like the Image Pro-Plus, does not segment correctly the microstructure elements of this cast iron, which are: cementite, pearlite and ledeburite.

To validate our SVRNA system, 30 samples of white cast iron were analyzed. The results obtained are very similar to the ones accomplished by visual examination. In fact, the microstructure elements of the material in analysis were correctly segmented and quantified by our SVRNA system, what did not happen when we used the Image Pro-Plus system. Therefore, the proposed system, based on mathematical morphology operators and an artificial neural network, offers to researchers, engineers, specialists and others of the Material Sciences field, a valuable and adequate tool for automatic and efficient microstructural analysis from images.

keywords: White cast iron, image segmentation, mathematical morphology, artificial neural network.

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