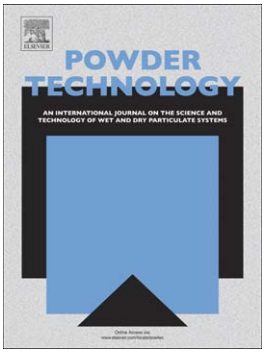

Fully automated primary particle size analysis of agglomerates on transmission electron microscopy images via artificial neural networks

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Fully automated primary particle size analysis of agglomerates on transmission electron microscopy images via artificial neural networks

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Abstract

There is a high demand for fully automated methods for the analysis of primary particle size distributions of agglomerates on transmission electron microscopy images. Therefore, a novel method, based on the utilization of artificial neural networks, was proposed, implemented and validated.

The training of the artificial neural networks requires large quantities (up to several hundreds of thousands) of transmission electron microscopy images of agglomerates consisting of primary particles with known sizes. Since the manual evaluation of such large amounts of transmission electron microscopy images is not feasible, a synthesis of lifelike transmission electron microscopy images as training data was implemented.

The proposed method can compete with state-of-the-art automated imaging particle size methods like the Hough transformation, ultimate erosion and watershed transformation and is in some cases even able to outperform these methods. It is however still outperformed by the manual analysis.

Keywords: imaging particle size analysis, agglomerate, transmission electron microscopy (TEM), artificial neural network (ANN), machine learning, image synthesis, Hough transformation, watershed transformation, ultimate erosion

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