

Demonstration of Efficient Transfer Learning in Segmentation Problem in Synchrotron Radiation X-ray CT Data for Epoxy Resin (STAM Methods [38])

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Background

- X-ray CT image analysis is used to investigate the internal structure of resins and the content of foreign substances.
- When inclusions with small density differences are present, the X-ray contrast decreases, making conventional threshold-based segmentation difficult and requiring more sophisticated methods.
- Although deep learning-based analysis of X-ray CT images typically requires large amounts of training data, collecting such data is inefficient in terms of both cost/time.

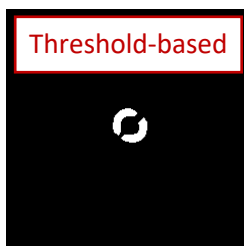
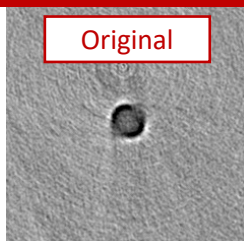
Approach

- We propose a method for efficiently developing learning models with limited training data by applying transfer learning using a Deep Deconvolutional Network (DDN).
- Transfer learning was applied to X-ray CT images of epoxy resin containing water to evaluate segmentation techniques for low-contrast image

Results

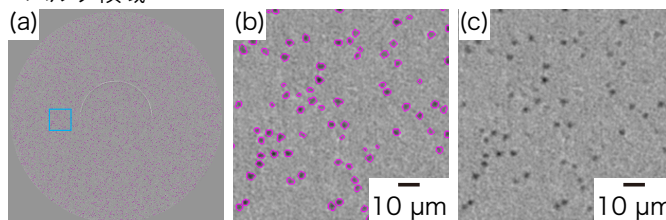
- The proposed approach successfully detected low-contrast circular domain structures from X-ray CT images.
- Segmentation of low-contrast data was achieved using transfer learning with only 12 X-ray CT image slices.
- The research results were published in a peer-reviewed journal and selected for inclusion in the Editor's Choice Collection.

Threshold-based
Approach does not work

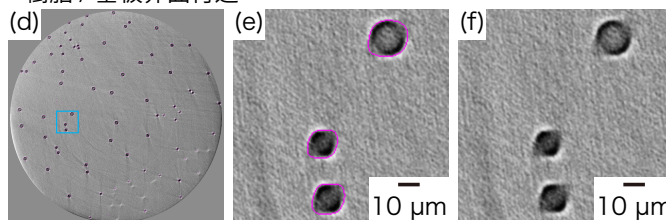


Approach using DNN transfer learning

バルク領域



樹脂 / 基板界面付近



セグメンテーションされたドメイン境界をマゼンタ実線で示した。

Press Release