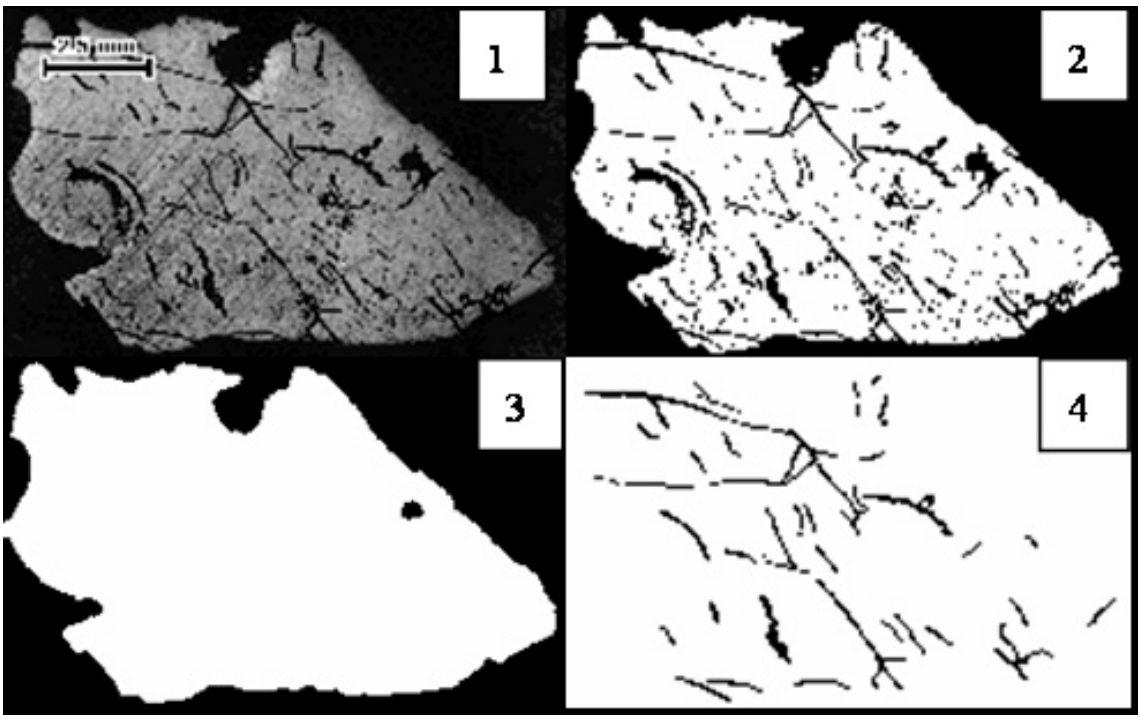
Crack Analysis by Image Analysis

Background and Relevance

During the lifetime and especially start-up of an electrolysis cell the carbon cathode is exposed to severe stresses and strains. These stresses may lead to cracking in the cathode lining. The magnitude of cracking can be analyzed with the described method. The method is not limited to cathode blocks.



The analysis procedure of an anthracite grain is outlined in the Figure. The following characteristics are shown in each image in the Figure:

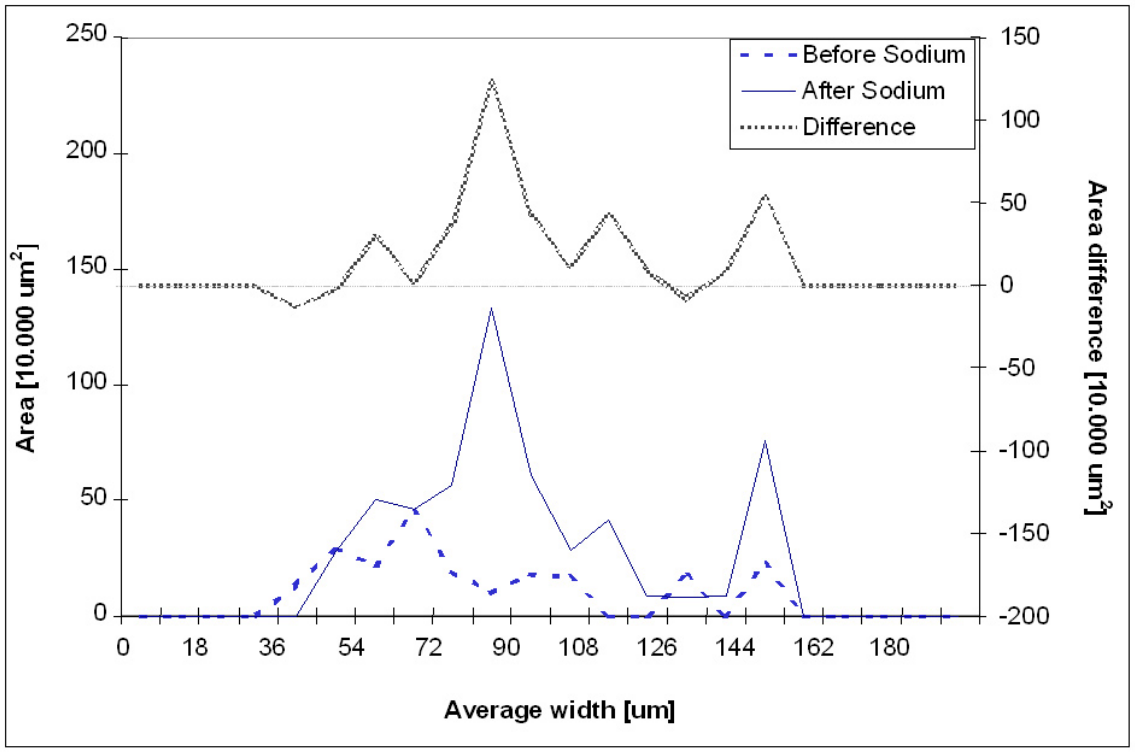
1 The original image.
2 A binary image is made of the grain and areas with a size of 1-2 pixels are removed.
3 Open areas without cracks are found.
4 The black areas (no cracks) from picture 3 are removed from picture 2. A visual control of the analysis is performed. If necessary, corrections to the image may be applied.

The output from the crack analysis is:

-Average and maximum crack width
-Crack area
-The position of the crack on the picture (x and y coordinates)
-Angle of crack relative to horizontal
-Length of cracks

Results

The Figure below shows the crack crack area and crack width distribution in an anthracite grain calcined to 1500 °C before and after exposure to sodium vapour.



Reference:

Jørund G. Hop and Harald A. Øye, "In-Situ Strength Reduction of Anthracitic Cathode Carbon and Crack Quantifying by the Use of Image Analysis", Light Metals 2001, p. 717

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