Miniaturization of electrochemical corrosion testing opportunities and practical use

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Meanwhile electrochemical corrosion tests are well accepted as accelerated corrosion test in science and industry. Usually, test conditions are well defined with a standard measuring cell and sample with a testing area of one or several cm². With such tests, the corrosion behaviour of homogeneous materials can be characterized very well. More difficult is it to characterize corrosion behaviour of inhomogeneous areas on materials as it is the case for weld seams and their heat affected zone, defects on coatings, etc. For such application a localized corrosion measurement is necessary.

In the last decade, miniaturized corrosion test cells have been developed. Some of them are even available in the market. It is clear that miniaturization of test cells requires compromises of the test set-up and will also reduce the statistical significance of test results. With other words, interpretation of test results from miniaturized test conditions needs to be done more carefully.

The aim of this study is to compare different mini-test-cells and results for a standard test cell for homogeneous and inhomogeneous conditions in order to make aware of possible miniaturization effects. For some examples the potential of miniaturized electrochemical testing on better understanding of the role of inhomogeneous conditions as well as the practical use of this miniaturization and interpretation of test results should be pointed out in this study.

Classical potentiodynamic test will be performed in order to measure typical corrosion values under different conditions as

- Open circuit potential
- Polarization resistance
- Passivation potential
- Pitting potential
- Repassivation potential
- Number of current transients

In addition, the influences of potential feed and electrolyte concentration on the course of the current-potential curves were determined.