

Abstracts**A Gentle Introduction to the Structure of Water**

Stephen Lower

Basic chemical theory predicts that a substance whose molecules are made up of just three lightweight atoms could not possibly exist as a liquid under ordinary conditions. This is just one of the "anomalous" properties that the structural unit H₂O confers on the liquid we know as water, and which enable this remarkable substance to play a central role in shaping both our planet and the living organisms on it.

This article attempts to show how the nature of water-the-molecule leads to higher-level structural elements that give water-the-substance its unique properties. The essential role of water in the human body has caused some science-naive seekers-of-health to stray into the realm of pseudoscience; sales of miracle water-treatment devices, homeopathic remedies and various fictional "structured" waters are now a thriving industry.

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Laboratory and Field Corrosion Performance of a High Chromium Alloy for Protection of Waterwall Tubes from Corrosion in Low NO_x Coal-Fired Boilers

Larry Paul, Gregg Clark, and Michael Eckhardt

Corrosion-resistant weld overlays are now commonly used to reduce corrosion of boiler tubes in low NO_x coal-fired boilers. Alloys with higher chromium contents are the most resistant to corrosion in this type of service. A new alloy with high chromium has recently been introduced and has shown excellent resistance to corrosion in low NO_x coal-fired environments. The new material is Alloy 33 (UNS R20033) and contains approximately 33 % chromium, 32 % iron and 31 % nickel. The improved corrosion resistance of Alloy 33 should result in longer life of the weld overlay used to protect boiler tubes. Alloy 33 should also better resist circumferential cracking than the Mo-containing alloys now being used (such as Alloys 622 and 625); recent studies show that Mo segregation in weld overlays may be part of the circumferential cracking mechanism. After an 18-month field test in a low NO_x coal-fired boiler, an Alloy 33 weld overlay has demonstrated that it resists both corrosion and cracking.

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A Critical Review of Measuring Techniques for Corrosion Rates under Flow Conditions

Guenter Schmitt and Mirdash Bakalli

The rotated disc, rotated cylinder, rotated cage, jet impingement, pipes and channels are frequently used to study the corrosion performance of materials in flowing media. All these corrosion investigation and test tools are discussed critically with respect to beneficial aspects and inherent shortcomings. Clear distinction is made between corrosion experiments and electrochemical measurements in order to clarify the depth of information and the limits of application of both approaches. This is important specifically for reliable estimation of threshold conditions for the initiation of flow induced localized corrosion (FILC). For all experimental tools the preferential range of flow regime, the known power laws for mass transport relationships with their range of validity, the equations to quantify wall shear stresses and the equations relating diffusion limited current densities (specifically from microelectrodes) to specific data of the flow system are given. The paper aims to help extracting as much information from flow experiments as possible.

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Calibration of On-Line Analysers in the Steam–Water Circuit of Power Plant

Eric Maughan

Analysers used for continuous surveillance of chemical variables in the plant cycle are often neglected with respect to calibration and basic maintenance. This presentation discusses the basics of calibration, validation and verification of on-line analysers. Techniques are presented to simplify the task of calibration with the objective of improving the quality of the measured results with minimum effort.

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