High temperature corrosion during biomass firing: improved understanding by depth resolved characterisation of corrosion products

The high temperature corrosion of an austenitic stainless steel (TP 347H FG), widely utilised as a superheater tube material in Danish power stations, was investigated to verify the corrosion mechanisms related to biomass firing. KCl coated samples were exposed isothermally to 560 degrees C, for one week, under conditions simulating straw-firing. Thorough characterisation of the exposed samples was conducted by the analysis of sample cross-sections applying microscopy and spectroscopy based techniques. Cross-section analysis revealed the microstructure, as well as chemical and morphological changes within the near surface region (covering both the deposit and the steel surface). Such cross-section analysis was further complemented by plan view investigations (additionally involving X-ray diffraction) combined with removal of the corrosion products. Improved insights into the nature of the corrosion products as a function of distance from the deposit surface were revealed through this comprehensive characterisation. Corrosion attack during simulated straw-firing conditions was observed to occur through both active oxidation and sulphidation mechanisms.

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, CHEC Research Centre, Department of Mechanical Engineering, Materials and Surface Engineering, COWI AS
Contributors: Okoro, S. C., Montgomery, M., Jappe Frandsen, F., Pantleon, K.
Pages: 92-101
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Materials at High Temperatures
Volume: 32
Issue number: 1-2
ISSN (Print): 0960-3409
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.3 SJR 0.669 SNIP 0.894
Web of Science (2017): Impact factor 1.423
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.72 SJR 0.364 SNIP 0.662
Web of Science (2016): Impact factor 0.802
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 0.65 SJR 0.348 SNIP 0.741
Web of Science (2015): Impact factor 0.709
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 0.46 SJR 0.353 SNIP 0.567
Web of Science (2014): Impact factor 0.42
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.81 SJR 0.516 SNIP 0.97
Web of Science (2013): Impact factor 0.837
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.46 SJR 0.297 SNIP 0.648
Web of Science (2012): Impact factor 0.344
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.6 SJR 0.281 SNIP 0.703
Web of Science (2011): Impact factor 0.481
ISI indexed (2011): ISI indexed yes