----- GENERAL INFORMATION -----

DATA TITLE: SEM/EDS analysis of surfaces of ferritic Fe-Cr-Al-Mo alloy Kanthal APMT and Cr-Mo-V steel T91 (UNS: K90901) after oxidation at 1200 C for 2 h
PROJECT TITLE: Materials Characterization of High-Temperature Oxidation on ferritic Fe-Cr-Al-Mo alloy Kanthal APMT and Cr-Mo-V steel T91 (UNS: K90901)

DATA ABSTRACT: Backscattered (BSE) and secondary electron (SE) images of surfaces on ferritic Fe-Cr-Al-Mo alloy Kanthal APMT and Cr-Mo-V steel T91 (UNS: K90901) before and after oxidation at 1200 C for 2 h in steam or air. In addition, energy-dispersive x-ray spectroscopy (EDS) maps are included, noting the elemental distribution of Al, O, and Fe on surfaces of Kanthal APMT, along with generated reports used to compare of major composition regimes observed on surface of air- and steam-oxidized specimens with respect to the control. For T91, raw Electron Microscopy Society of America (EMSA) files for EDS spectra acquired from sites of interest depicted in the included images are also available.

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ASSOCIATED PUBLICATIONS:

COLLECTION INFORMATION:

Time period(s): 2017-2019

Location(s): Iowa State University, Brookhaven National Laboratory

----- FILE DIRECTORY -----

----- FILE LIST-----

File Name	Description
EDS_APMT_Air.jpg	BSE image taken at the surface of Kanthal APMT after oxidation in air
EDS_APMT_Air.rtf	EDS report generated from elemental analysis of EDS_APMT_Air.jpg

EDS_APMT_Air_Al.jpg	EDS elemental map generated showing the distribution of Al in EDS_APMT_Air.jpg
EDS_APMT_Air_Fe.jpg	EDS elemental map generated showing the distribution of Fe in EDS_APMT_Air.jpg
EDS_APMT_Air_O.jpg	EDS elemental map generated showing the distribution of O in EDS_APMT_Air.jpg
EDS_APMT_Control.rtf	EDS report generated from elemental analysis of a site of interest captured on the surface of a control Kanthal APMT specimen
EDS_APMT_Steam.jpg	BSE image taken at the surface of Kanthal APMT after oxidation in steam
EDS_APMT_Steam.rtf	EDS report generated from elemental analysis of EDS_APMT_Steam.jpg.
EDS_APMT_Steam_Al.jpg	EDS elemental map generated showing the distribution of Al in EDS_APMT_Steam.jpg
EDS_APMT_Steam_Fe.jpg	EDS elemental map generated showing the distribution of Fe in EDS_APMT_Steam.jpg
EDS_APMT_Steam_O.jpg	EDS elemental map generated showing the distribution of O in EDS_APMT_Steam.jpg
EDS_T91_Air.jpg	BSE image taken at the surface of T91 after oxidation in air
EDS_T91_Air.txt	Spectra data acquired from site of interest shown in EDS_T91_Air.jpg
EDS_T91_Steam.jpg	BSE image taken at the surface of T91 after oxidation in steam
EDS_T91_Steam.txt	Spectra data acquired from site of interest shown in EDS_T91_Steam.jpg
SEM_APMT_Air.jpg	BSE image taken at the surface of Kanthal APMT after oxidation in air
SEM_APMT_Air_Metadata.txt	Metadata of imaging settings used to acquire SEM_APMT_Air.jpg
SEM_APMT_Steam.jpg	BSE image taken at the surface of Kanthal APMT after oxidation in steam
SEM_APMT_Steam_Metadata.txt	Metadata of imaging settings used to acquire SEM_APMT_Steam.jpg

----- METHODS AND MATERIALS -----

----- DATA COLLECTION METHODS -----

For EDS_APMT_Steam.rtf, EDS_APMT_Control.rtf, and EDS_APMT_Air.rtf: Reports generated in the INCA software suite an image of the site of interest, numbered locations were elemental analysis information was extracted within that site of interest, a table listing the sites and respective elemental wt% information (total normalized to 100 wt%). Three of those sites were selected for INCA to calculate the statistics located at the bottom of the table (i.e. mean, standard (std.) deviation, max, and min).

For EDS_T91_Steam.txt and EDS_T91_Air.txt: Spectra acquired from sites of interest featured in EDS_T91_Steam.jpg and EDS_T91_Air.jpg, respectively, were exported in EMSA format, including all data acquisition metadata, location of element labels on spectra (i.e. OXINSTLABEL: [atomic number], [energy (eV)], [element]), and the spectral data in comma-separated value format.

----- DATA PROCESSING METHODS -----

For EDS_APMT_Steam.rtf, EDS_APMT_Control.rtf, and EDS_APMT_Air.rtf: The std. deviation information was used to calculate the standard error of the mean O, Al, and Fe elemental wt %. The mean and standard error for O, Al, and Fe for control, air-oxidized, and steam-oxidized APMT sites of interest were then plotted in Origin as the bar graphs shown in Figure 3c) and f) of the associated publication.

For EDS_T91_Steam.txt and EDS_T91_Air.txt: EMSA data files were plotted in Origin to generate Figure 3i) in associated publication.

------- SOFTWARE -------

Name: OriginLab 2016
Version: 64-bit
System Requirements:

 Windows: Operating System: 64-bit (x64) Microsoft Windows® 7 SP1, Windows® 8, Windows® 8.1, Windows® 10; Processor: 1.6 GHz 64-bit (x64); Memory: 4 GB RAM (8 GB recommended); Hard Disk Space: 2.0 GB of free hard disk space for program installation + Help files (does not include data storage); Other hardware: USB port or DVD drive (if installing from USB stick or DVD); Browser: The Learning Center dialog requires Internet Explorer version 11.

 Mac: Mac users can run Origin by using Microsoft Windows® via Boot Camp or within OS X using third-party virtual machine software.

URL: http://www.originlab.com

Developer: OriginLab Corporation

Additional Notes: N/A

Name: INCA™ - The Microanalysis Suite

Version: 4.15

System Requirements: N/A

URL: https://www.oxinst.com

Developer: Oxford Instruments

Additional Notes: N/A

------- EQUIPMENT -------

Manufacturer: JEOL

Model: 7600F

Embedded Software/Firmware Name: (if applicable) N/A

Embedded Software/Firmware Version: (if applicable) N/A

Additional Notes: Equipped with Oxford Instruments EDS 80 mm^2 X-Max silicon drift detector
(129 eV resolution) operated through the INCA software suite.

------- LICENSING -------

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