

1 *Supplement of*

2 **Formation and origin of Fe-Si oxyhydroxide deposits at the ultra-slow spreading**  
3 **Southwest Indian Ridge**

4

5 Kaiwen Ta<sup>1,2</sup>, Zijun Wu<sup>1\*</sup>, Xiaotong Peng<sup>2</sup> and Zhaofu Luan<sup>1</sup>

6

7 <sup>1</sup>School of Ocean and Earth Science and State Key Laboratory of Marine Geology,  
8 Tongji University, Shanghai, China.

9 <sup>2</sup>Deep Sea Science Division, Institute of Deep Sea Science and Engineering, Chinese  
10 Academy of Sciences, Sanya, China.

11

12 Correspondence: Zijun Wu (wuzj@tongji.edu.cn)

13

14

15

16 **Contents of this file**

17

18 Supplementary Figure S1: Hydrothermal Fe-Si oxyhydroxide deposits were recovered  
19 from the ultra-slow spreading SWIR. (a) DIV95, (b) 21V-T7, (c) 21V-T1, (d) 20V-T8,  
20 (e) 34II-T22.

21 Supplementary Figure S2: XRD patterns of hydrothermal Fe-Si oxyhydroxide deposits  
22 at the SWIR. S1-S6 showing samples DIV95-1, DIV95-2, 34II-T22, 21V-T7, 21V-T1,  
23 20V-T8, respectively.

24 Supplementary Figure S3: TEM images displaying the mineralized Fe-Si  
25 oxyhydroxides in samples 34II-T22 (a) and 20V-T8 (b). (c) EDS from the area  
26 defined by the red dot in panel a. (d) EDS from the area defined by the red dot in  
27 panel b. Cu came from Cu net in Figures c and d.

28 Supplementary Figure S4: (a) Fe-oxidizing bacteria gradient tube cultured with FeS<sub>2</sub>.  
29 (b) Fluorescence micrographs of cells showing filamentous morphologies (green),  
30 stained with SYBR Green I. (b) Fe-oxidizing bacteria (green).

31 Supplementary Table S1: Investigated hydrothermal Fe-Si oxyhydroxide deposits  
32 from the SWIR.

33 Supplementary Table S2: . Sequential extraction procedure of iron speciation studies  
34 and targeted minerals.

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

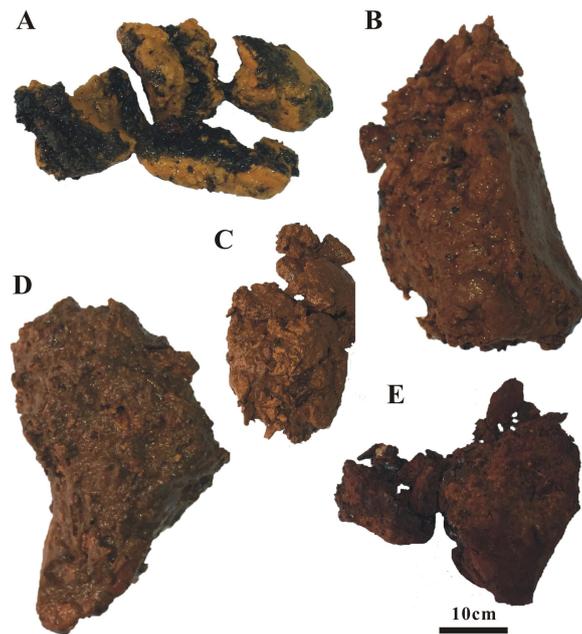
62

63

64

65

66



67 Supplementary Figure S1. Hydrothermal Fe-Si oxyhydroxide deposits were recovered

68 from the ultra-slow spreading SWIR. (a) DIV95, (b) 21V-T7, (c) 21V-T1, (d) 20V-T8,

69 (e) 34II-T22.

70

71

72

73

74

75

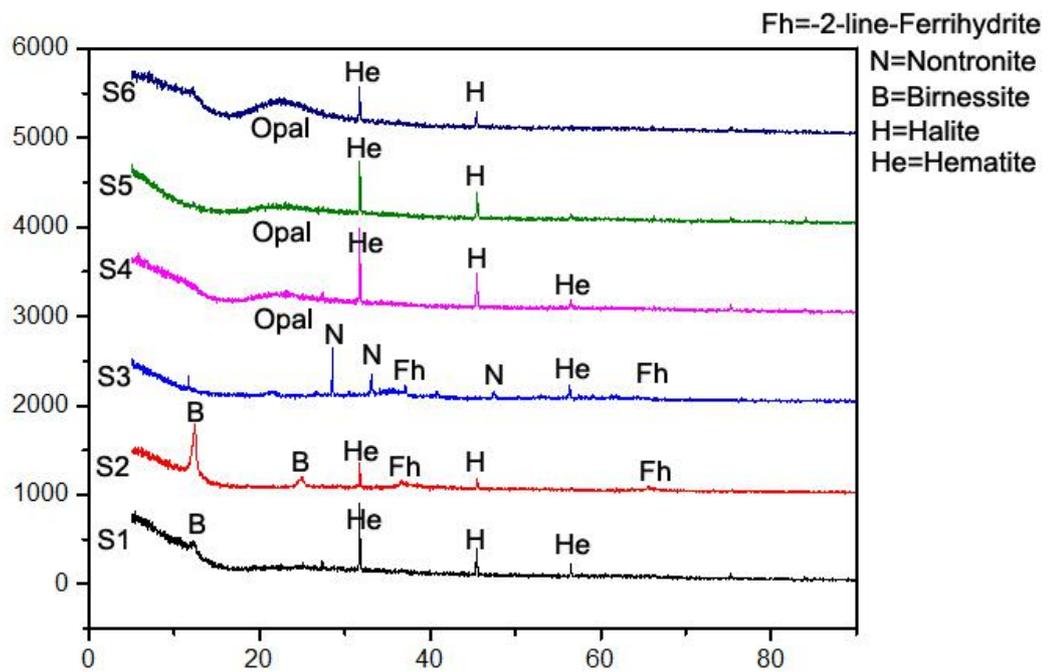
76

77

78

79

80



82

83 Supplementary Figure S2. XRD patterns of hydrothermal Fe-Si oxyhydroxide deposits  
 84 at the SWIR. S1-S6 showing samples DIV95-1, DIV95-2, 34II-T22, 21V-T7, 21V-T1,  
 85 20V-T8, respectively.

86

87

88

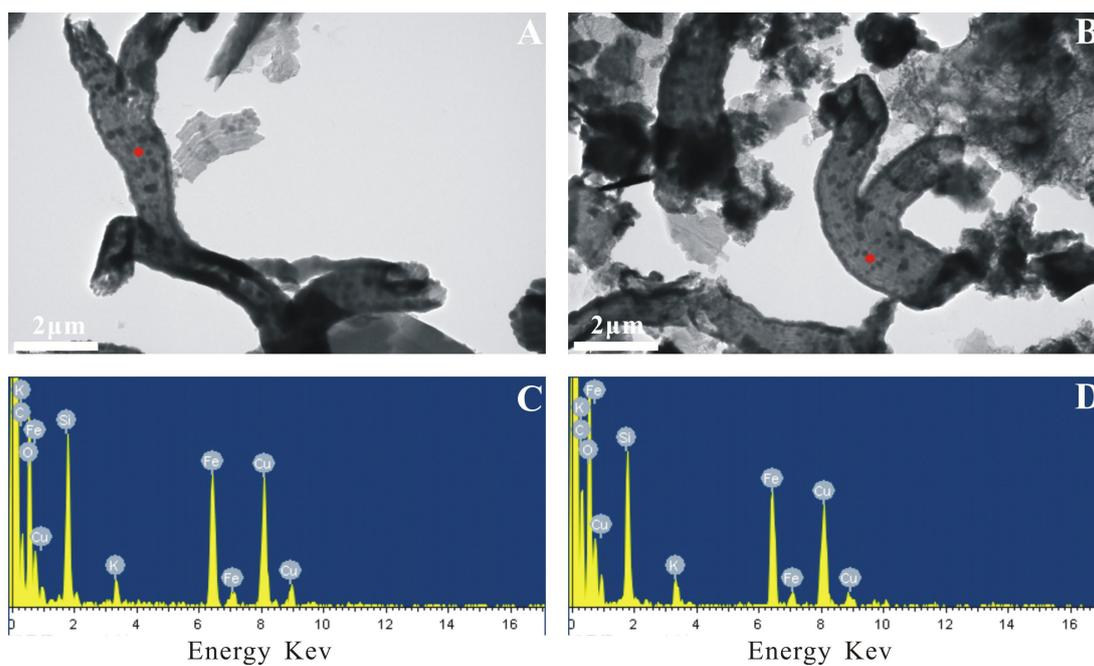
89

90

91

92

93



94

95 Supplementary Figure S3. TEM images displaying the mineralized Fe-Si  
 96 oxyhydroxides in samples 34II-T22 (a) and 20V-T8 (b). (c) EDS from the area  
 97 defined by the red dot in panel a. (d) EDS from the area defined by the red dot in  
 98 panel b. Cu came from Cu net in Figures c and d.

99

100

101

102

103

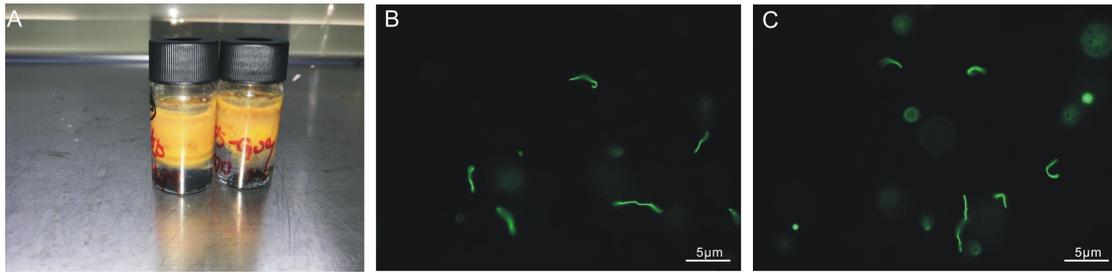
104

105

106

107

108



109

110 Supplementary Figure S4. (a) Fe-oxidizing bacteria gradient tube cultured with  $\text{FeS}_2$ .

111 (b) Fluorescence micrographs of cells showing filamentous morphologies (green),

112 stained with SYBR Green I. (c) Fe-oxidizing bacteria (green).

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130 Supplementary Table S1. Investigated hydrothermal Fe-Si oxyhydroxide deposits  
 131 from the SWIR.

Sample#	Latitude (E)	Longitude (N)	Depth (m)	Hand sample description
DIV95-1	49.6482°	37.7794°	2764.3	Orange-yellowish layer of deposits collected by Jiaolong human occupied vehicle (HOV) during the cruise of XYH09 in Feb 2015
DIV95-2	49.6482°	37.7794°	2764.3	Black layer of deposits collected by Jiaolong HOV during the cruise of XYH09 in Feb 2015
34II-T22	49.2580°	37.9425°	1499	Purple-red deposits collected by a TV-grabber during the cruise of R/V DaYang One in Jan 2015
21V-T1	49.3888°	37.4697°	2784	Yellowish deposits collected by a TV-grabber during the cruise of R/V DaYang One in Jan 2010
21V-T7	49.3894°	37.4699°	2746	Brown deposits containing volcanic glass shards collected by a TV-grabber during the cruise of R/V DaYang One in Jan 2010
20V-T8	50.2803°	37.3952°	1740	Brown deposits collected by a TV-grabber during the cruise of R/V DaYang One in Nov 2008

132  
 133  
 134  
 135  
 136  
 137  
 138  
 139  
 140  
 141  
 142  
 143  
 144  
 145  
 146

147 Supplementary Table S2. Sequential extraction procedure of iron speciation studies  
148 and targeted minerals.

	<b>Pool</b>	<b>Extraction Agent</b>	<b>Fe Fractions</b>
1	Fe <sub>carb</sub>	25 mL, 1 M Na-acetate, pH 4.5, 24 h 50 °C	Carbonate iron and siderite
2	Fe <sub>ox1</sub>	25 mL, 1 M hydroxylamine-HCl, 48 h	Poorly crystalline Fe (oxyhydr)oxides, ferrihydrite and lepidocrocite
3	Fe <sub>ox2</sub>	25 mL, 0.28 M Na-dithionite, pH 4.8, 2 h	Goethite, hematite, and akaganeite
4	Fe <sub>PRS</sub>	30mL, 12M HCl, 1 min boiling	Poorly reactive sheet silicate iron

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167