Supplemental Figures and Tables

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Table S1. Scan Collection Parameters.

Element	E Start (eV)	E End (eV)	Pre-Edge Background Spacing	XANES Spacing	EXAFS Spacing	Time per Point (s)	# Scans
As	11767	13391	5	0.25	0.05k	0.5	104
Fe	7012	8346	5	0.25	0.05k	1	64
Ga	10267	11114	4.091	0.25	0.05k	1	5
Ge	11003	11850	5	0.25	0.05k	1	10
Mn	6454	7088	5	0.25	0.05k	1	6
Ti	4866	5713	5	0.25	0.05k	1	60
Al	1540	1839	5	0.25	0.5 to 1.0 eV	3	2
Si	1816	2445	2	0.1	0.25 to 4.0 eV	3	7

Figure S1. X-ray fluorescence map of part of the Topaz-64 (110) surface, at the center of a large polygonized spiral-growth hillock. Color intensity is proportional to signal (concentration) of As (red), Fe (green), and Ti (blue). Notation of the hillock's vicinal faces A, B, B' and C are as in Northrup and Reeder 1994; A is highest in As and Fe concentrations while C is highest in Ti. The *c* axis is indicated. The incident X-ray beam intersects this surface at 45 degrees, from the right. Note the black spot in the center contains some blue and green pixels, indicating Ti- and Fe-rich inclusions, while the green pixels in the lower right indicate an Fe-rich inclusion there. The circle to the left marks the approximate area where the microbeam EXAFS measurements were made, in a region determined to be free of any inclusions bearing elevated As, Fe, Ga, Ge, Mn, or Ti.

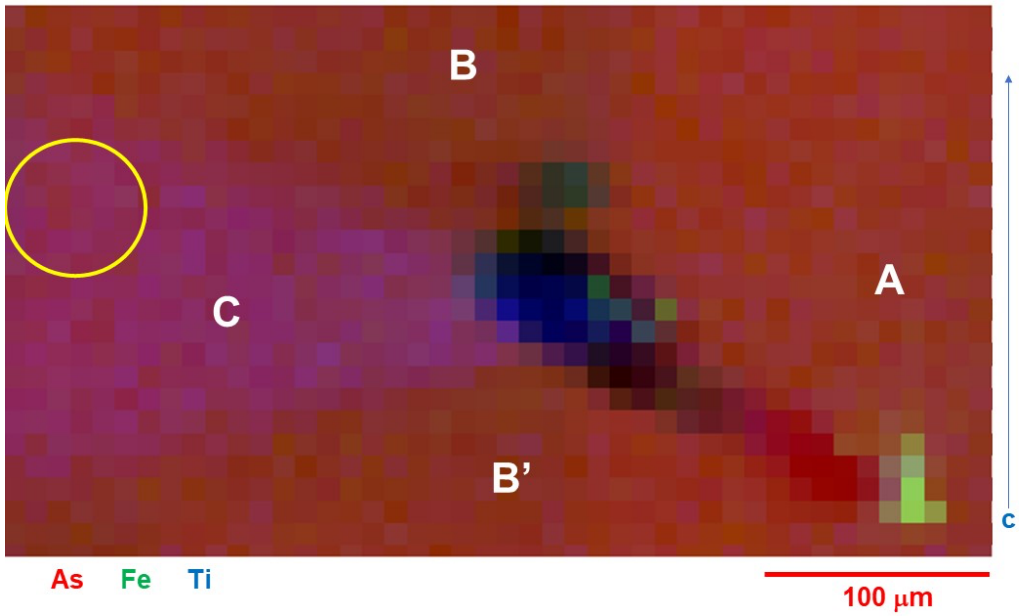

Figure S2. Merged XAS spectra for each analyzed element.

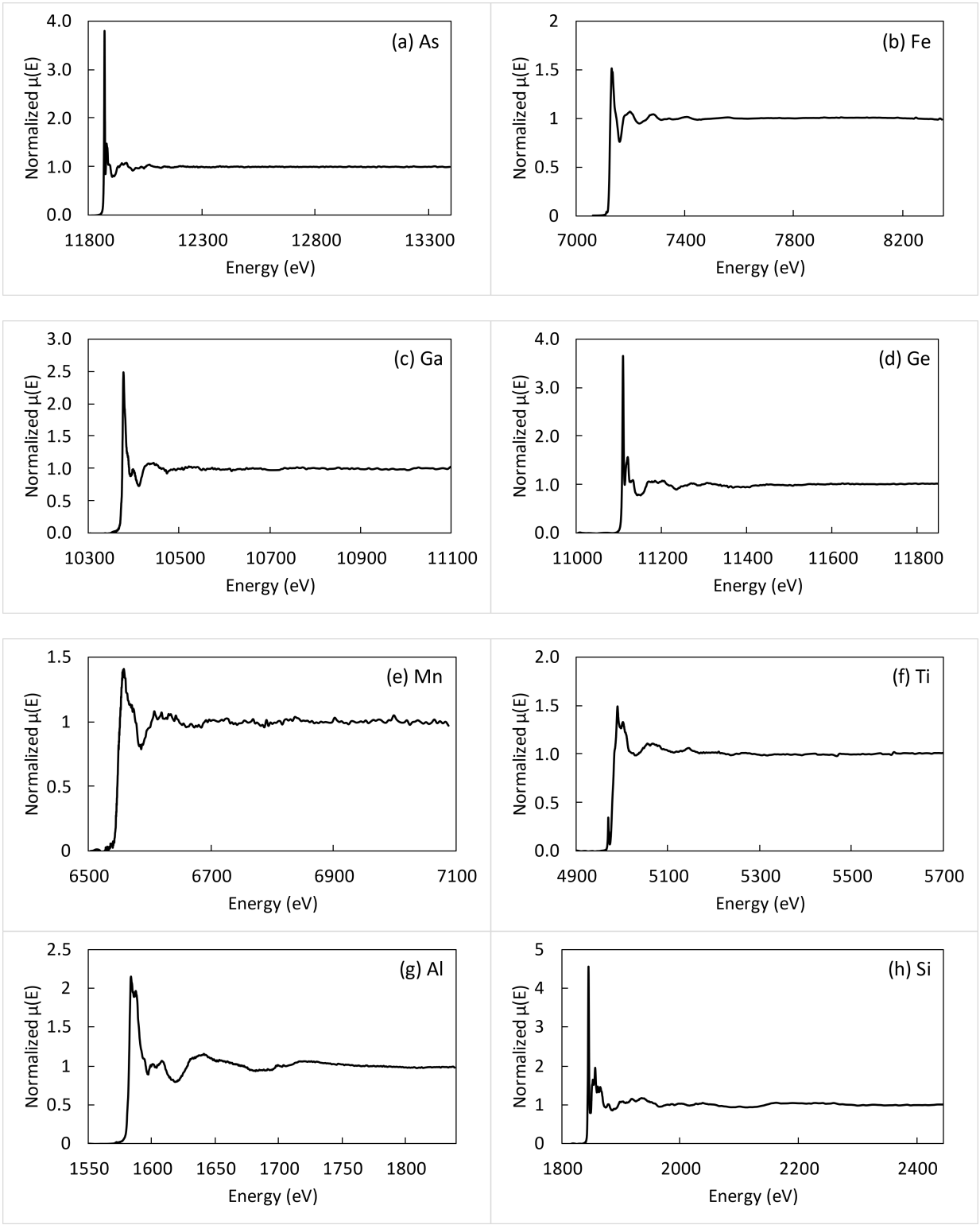

Figure S3. EXAFS data and fit for iron. (a) k, (b) q, (c) R-real component.

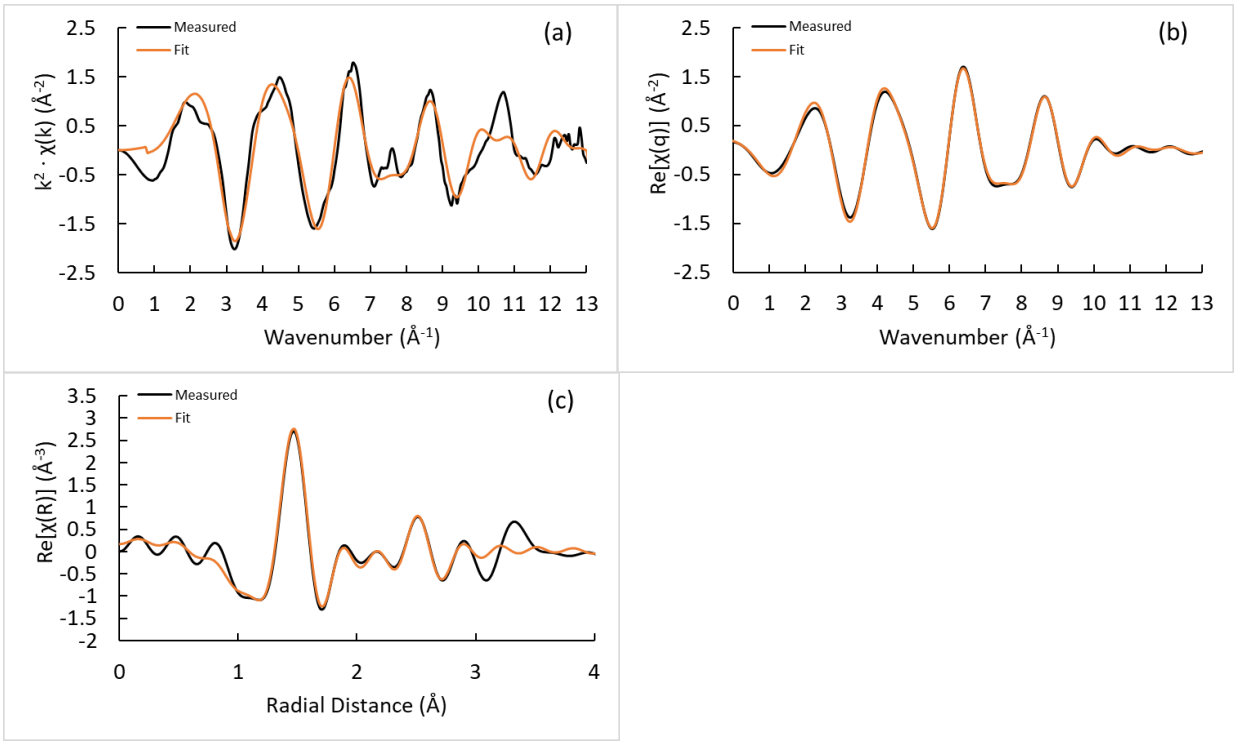

Figure S4. EXAFS data and fit for gallium. (a) k, (b) q, (c) R-real component.

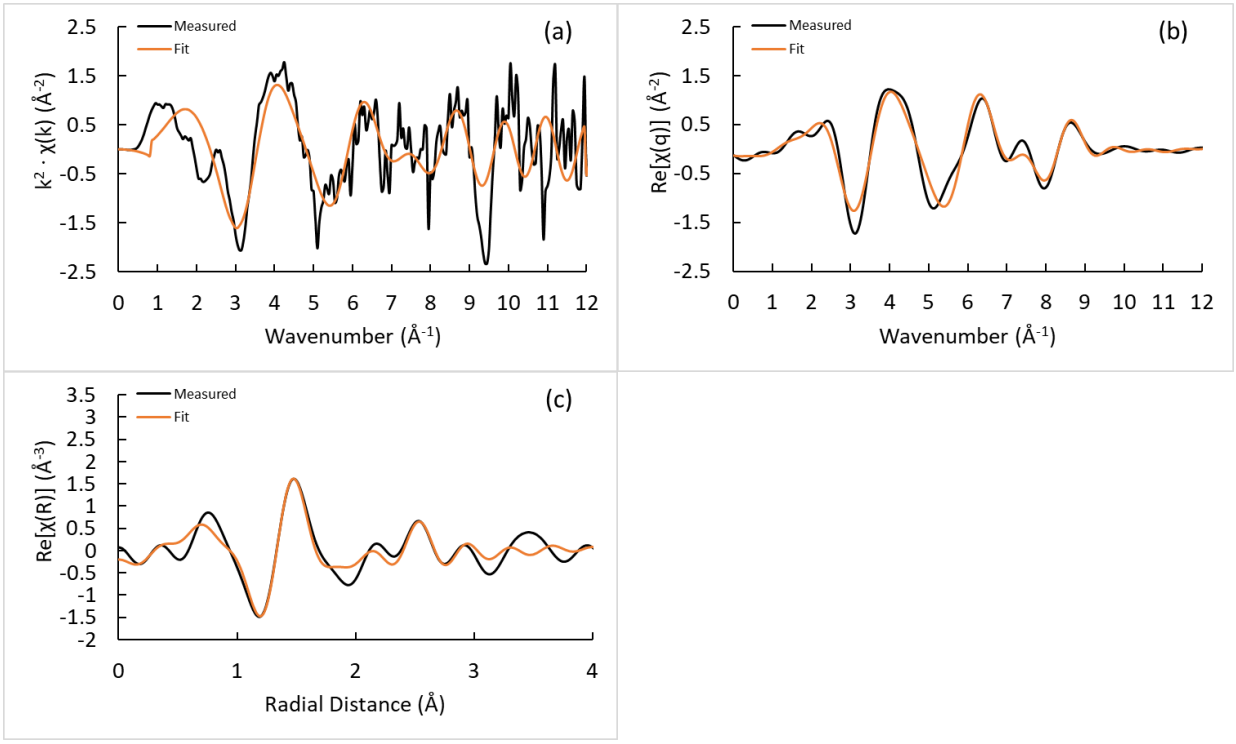

Figure S5. EXAFS data and fit for germanium. (a) k, (b) q, (c) R-real component.

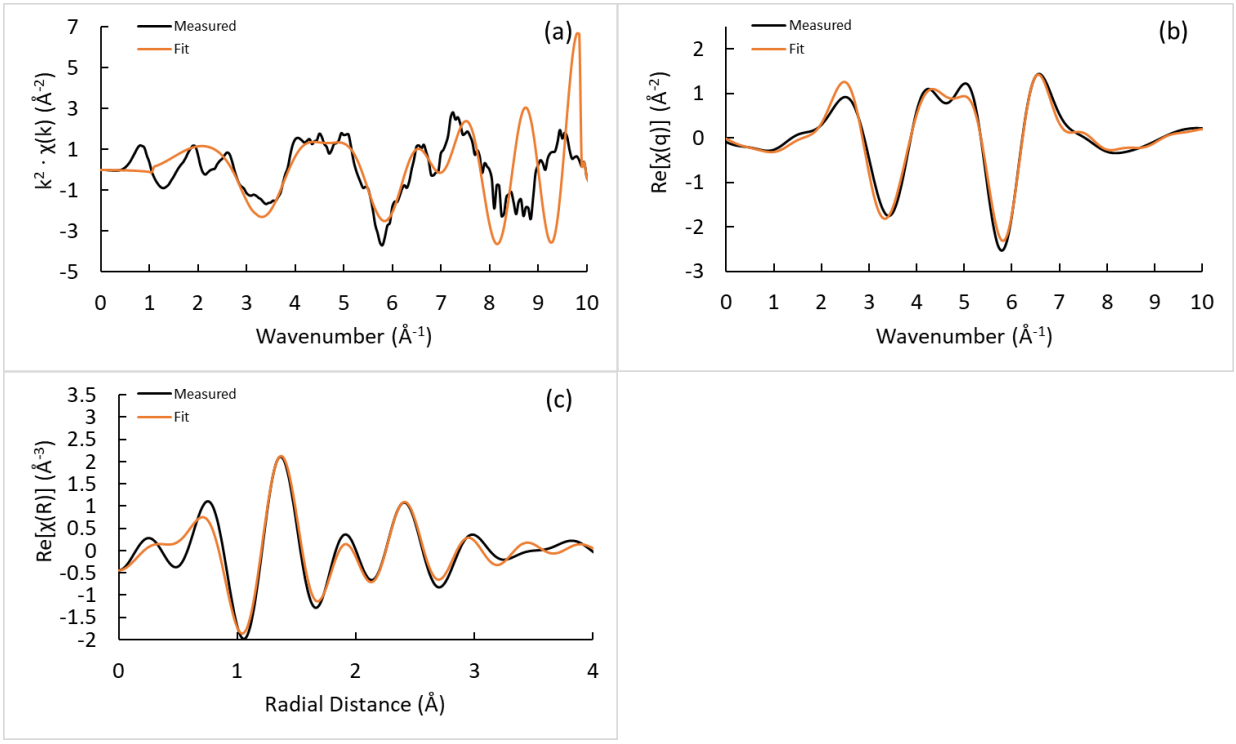

Figure S6. EXAFS data and fit for manganese. (a) k, (b) q, (c) R-real component.

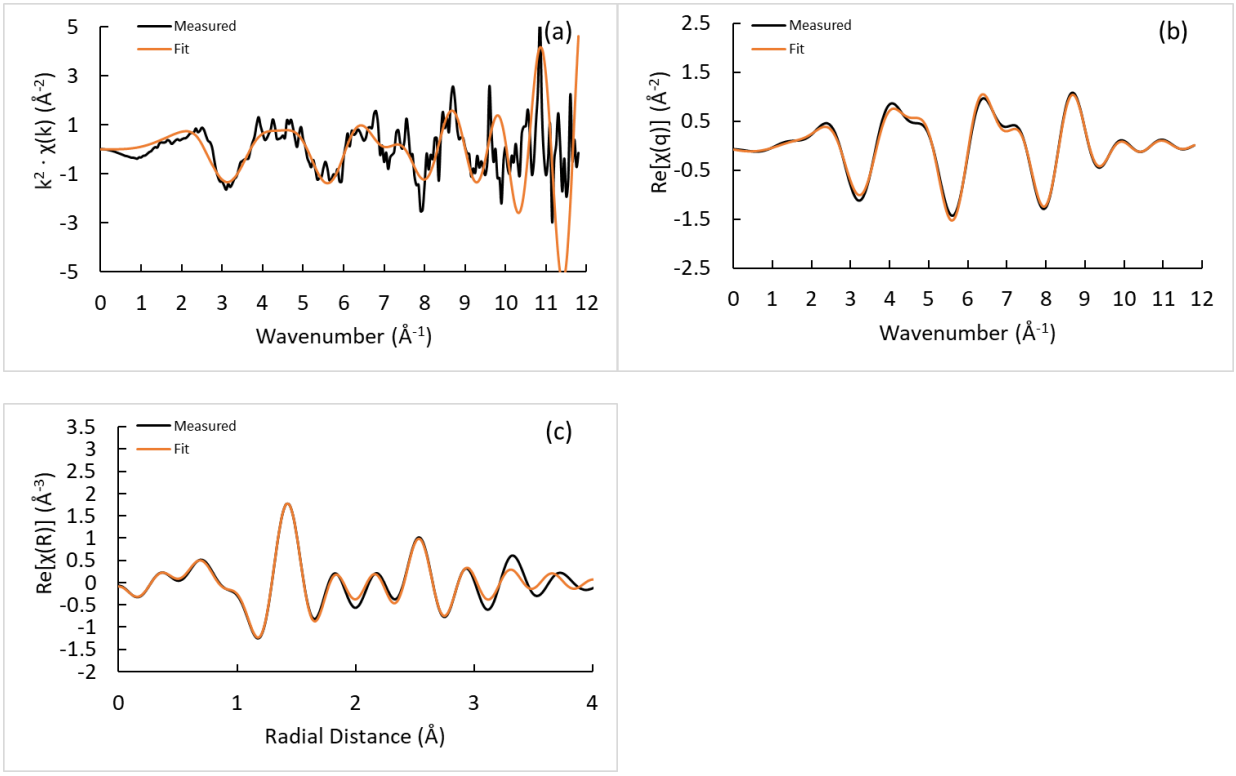

Figure S7. EXAFS data and fit for titanium. (a) k, (b) q, (c) R-real component.

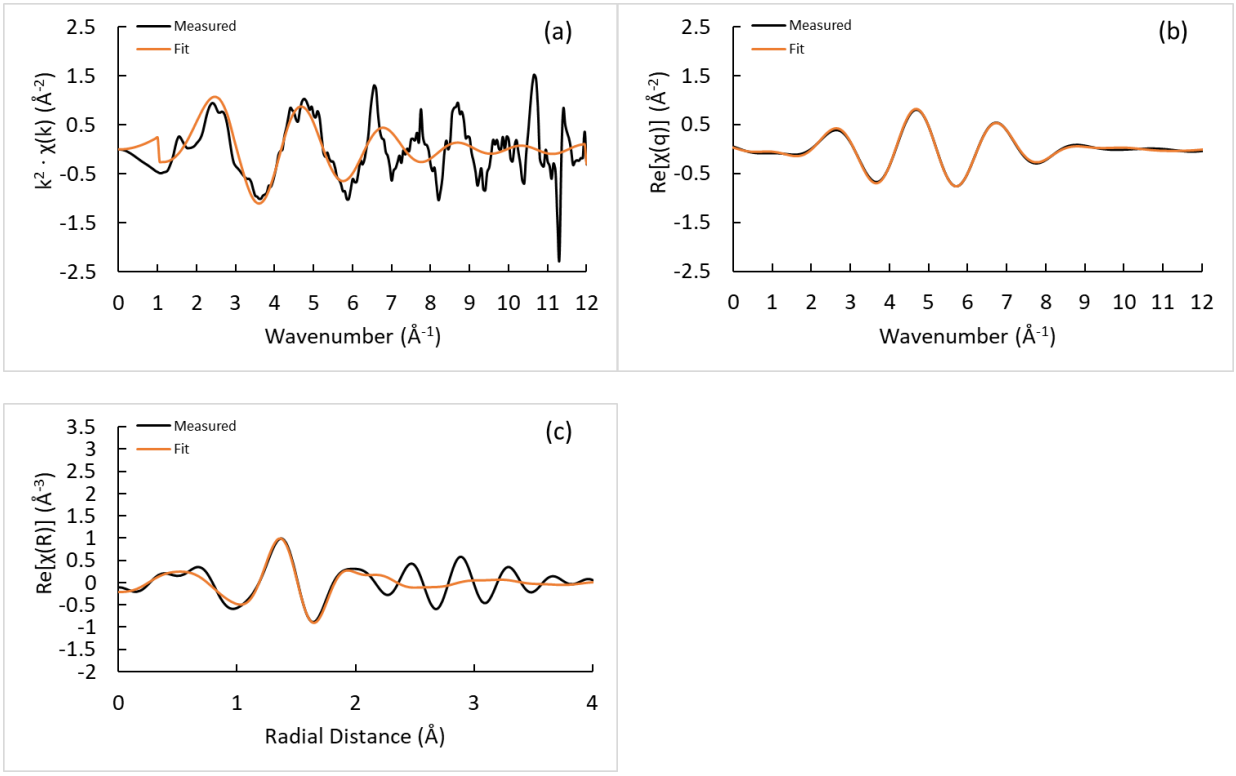

Figure S8. EXAFS data and fit for aluminum. (a) k, (b) q, (c) R-real component.

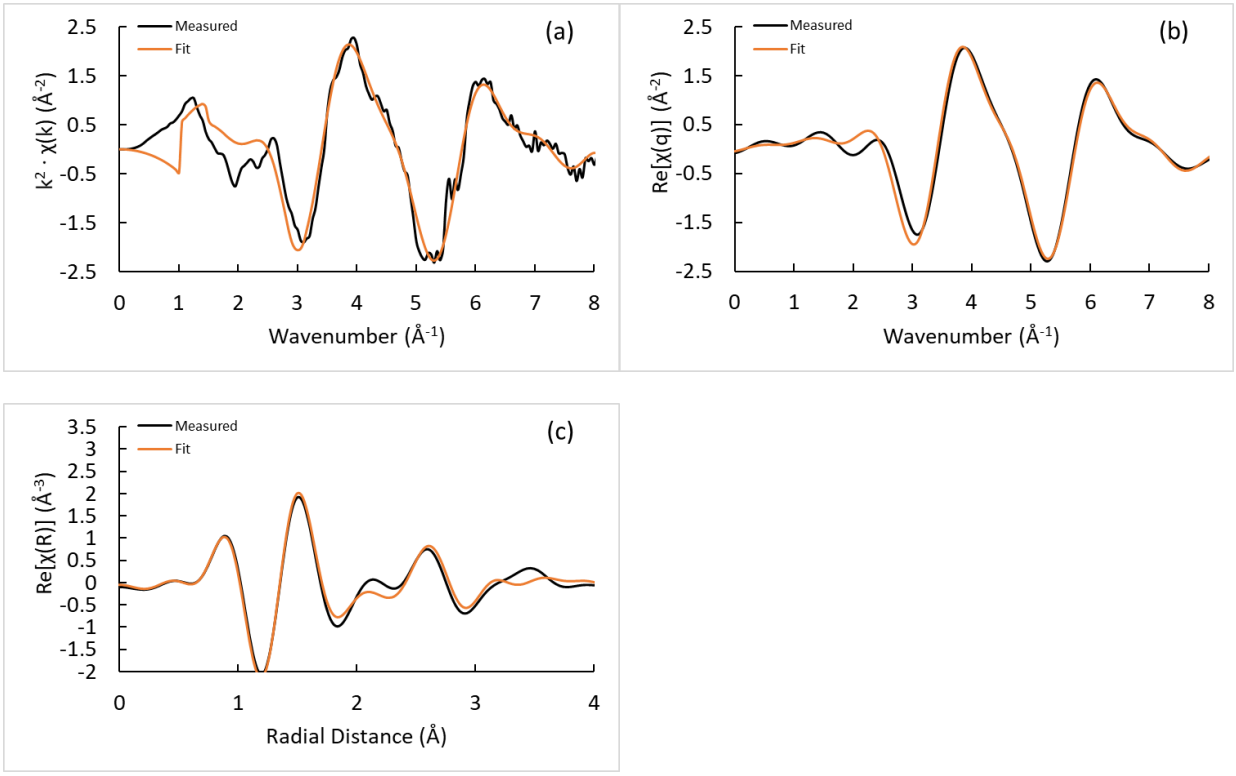

Figure S9. EXAFS data and fit for silicon. (a) k, (b) q, (c) R-real component.