**Supplemenatry Information for DOI: 10.1039/b823504j**

The EXAFS data and corresponding Fourier transforms that were fitted to provide the structural parameters reported in tables 3 and 4 of the manuscript are provided below.

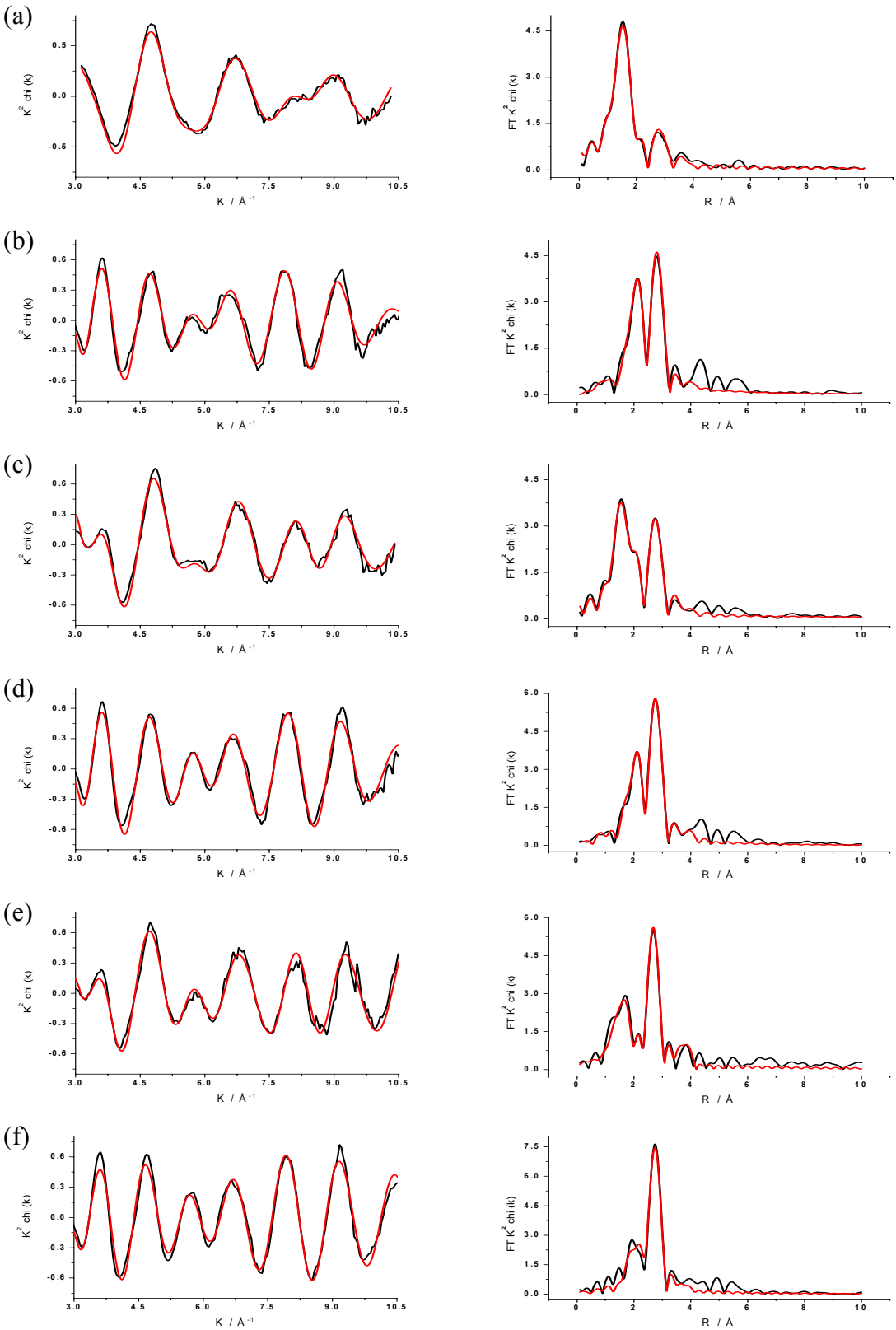


**Figure 1** **Pd K edge (left) $k^2$ weighted experimental data and fit along with (right) the Fourier transform for 0.5 Pd/Pt/C acquired in air and $H_2$ (a & b), 1 Pd/Pt/C acquired in air and $H_2$ (c & d), and 1.5 Pd/Pt/C acquired in air and $H_2$ (e & f). Data (black line) and fit (red line).**

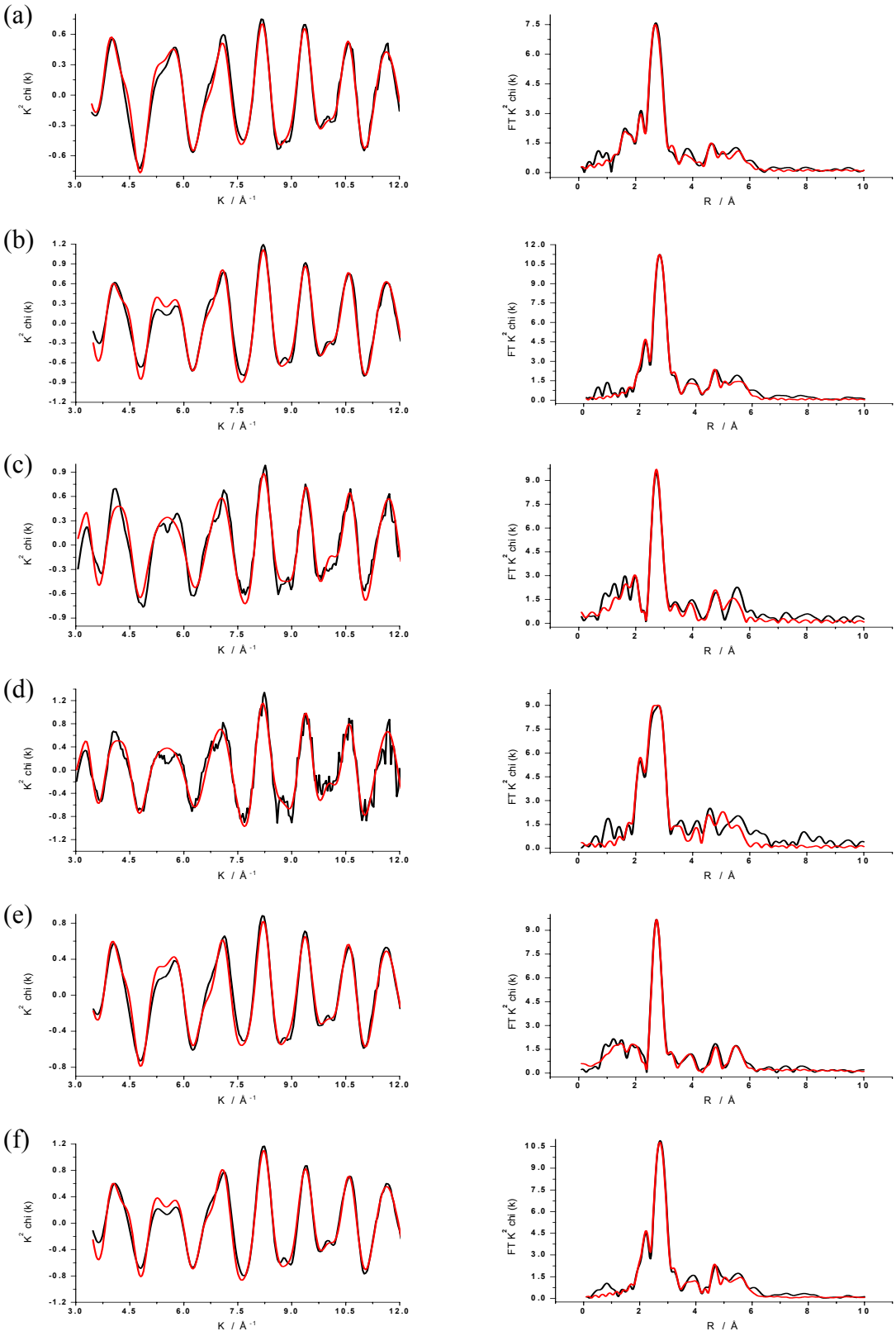


**Figure 2** **Pt $L_3$ edge (left) $k^2$ weighted experimental data and fit along with (right) the Fourier transform for 0.5 Pd/Pt/C acquired in air and $H_2$ (a & b), 1 Pd/Pt/C acquired in air and $H_2$ (c & d), and 1.5 Pd/Pt/C acquired in air and $H_2$ (e & f). Data (black line) and fit (red line)**

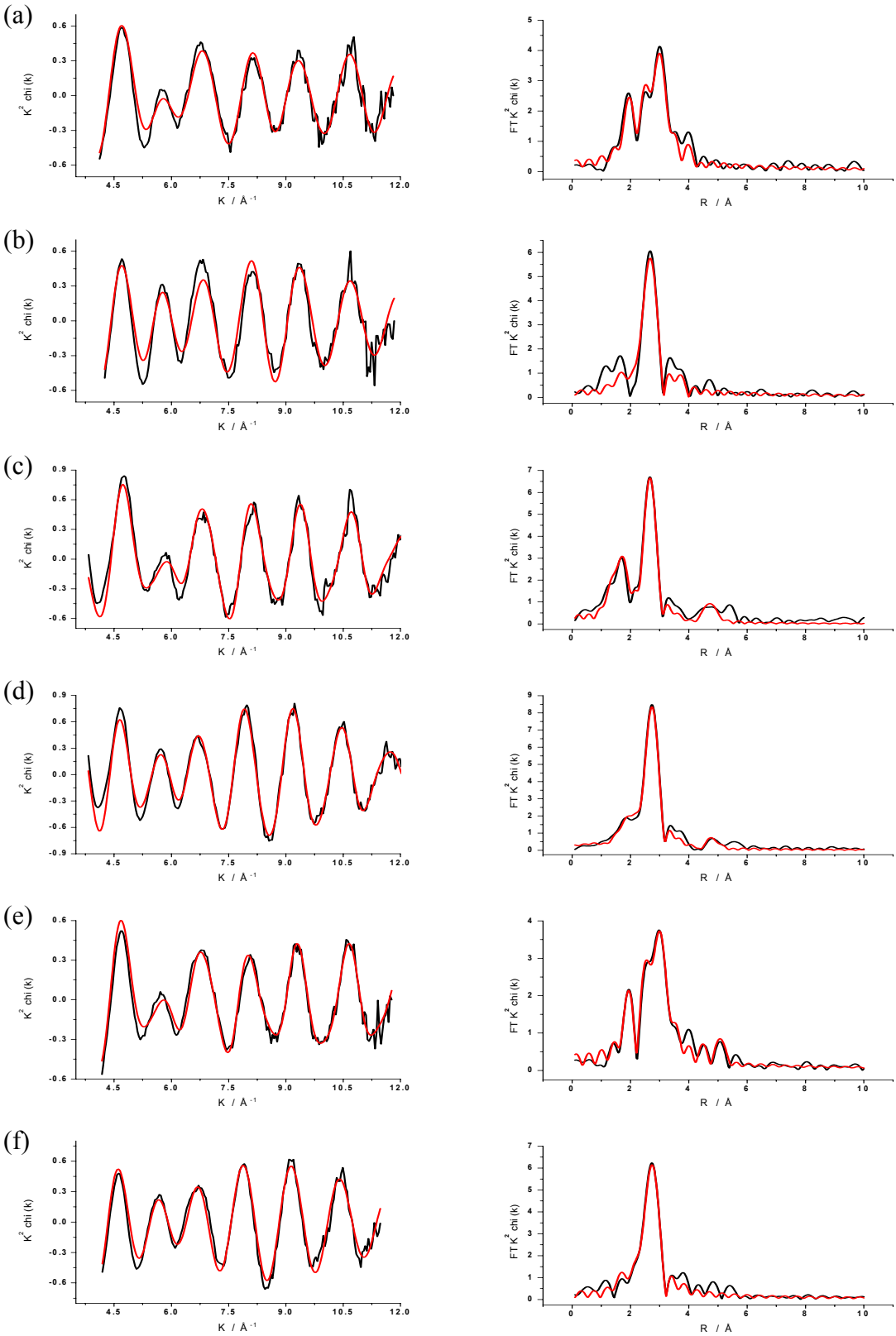


**Figure 3** **Pd K edge (left) $k^2$ weighted experimental data and fit along with (right) the Fourier transform for 0.5 Pt/Pd/C acquired in air and $H_2$ (a & b), 1 Pt/Pd/C acquired in air and $H_2$ (c & d), and 1.5 Pt/Pd/C acquired in air and $H_2$ (e & f). Data (black line) and fit (red line).**

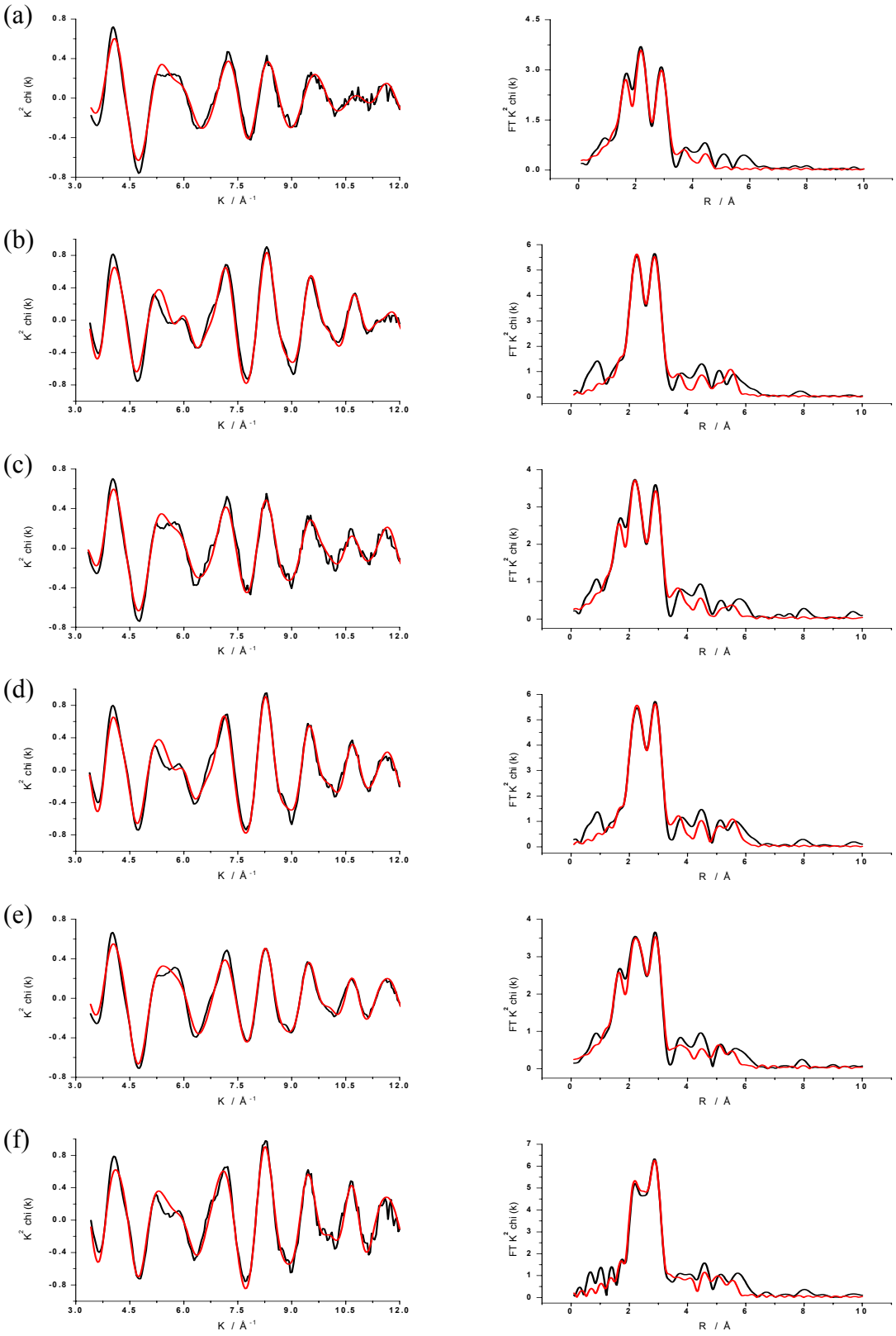


**Figure 4** **Pt $L_3$ edge (left) $k^2$ weighted experimental data and fit along with (right) the Fourier transform for 0.5 Pt/Pd/C acquired in air and $H_2$ (a & b), 1 Pt/Pd/C acquired in air and $H_2$ (c & d), and 1.5 Pt/Pd/C acquired in air and $H_2$ (e & f). Data (black line) and fit (red line).**