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RESEARCH ARTICLE

Anisotropic hybridization dynamics in the quasi-one-dimensional kondo lattice $CeCo_2Ga_8$ revealed by ultrafast optical spectroscopy

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Supporting Information

The supplemental materials to 'Anisotropic Hybridization Dynamics in the Quasi-One-Dimensional Kondo Lattice $CeCo_2Ga_8$ Revealed by Ultrafast Optical Spectroscopy' contains 'Comparison of exponential decay fits for *p*-polarized transient reflectivity curves' and 'Decomposition of exponential decays fitting'.

1. Comparison of exponential decay fits for *p*-polarized transient reflectivity curves

Figure S1 shows the results of fitting the transient reflectivity at 30 K (upper panel) and 140 K (lower panel) using a three- and two-exponential decay function, as described by Eq. (1) in the main text. At 30 K, the three-exponential function accurately captures the dynamics, particularly the hump structure around 5 ps. In contrast, the two-exponential fit fails to reproduce this feature, suggesting the presence of an additional relaxation process at 30 K. This additional component likely reflects the complex interplay of relaxation pathways related to the formation of the hybridized state below 90 K.

At 140 K, both two- and three-exponential functions can adequately fit the data. This indicates that the additional relaxation process observed at lower temperatures is no longer significant at higher temperatures, which is consistent with the weakening or absence of hybridization.

To maintain consistency and allow for a direct comparison of fitting parameters across the entire temperature range, we have used the three-exponential function to analyze the data at temperatures below 90 K. For temperatures at or above 90 K, where the additional component is negligible, we use the simpler two-exponential function for the sake of parsimony.

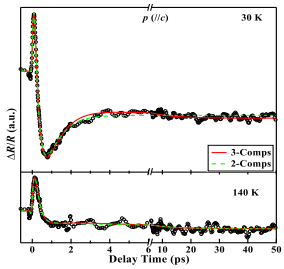

Fig. S1 Fitting results of the transient reflectivity for p-polarization at a pump fluence of 40 μJ/cm^2, measured at 30 K (upper panel) and 140 K (lower panel). The red solid and green dashed lines represent the fits using three- and two-exponential decay functions, respectively.

2. Decomposition of exponential decays fitting

Figure S2 present the fitting results for the 30 K data under *s*-polarization using a four- -exponential decay function, with A_1 constrained to zero, effectively reducing it to a three-exponential decay function. Figure S3 present the fitting results for the 30 K data under *p*-polarization using a three-exponential decay function. The fit accurately describes the data, with each component represented by dashed lines.

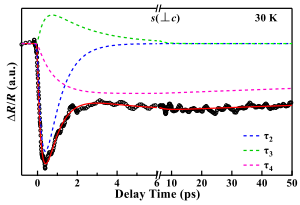

Fig. S2 Fitting of the 30 K transient reflectivity signal under *s*-polarization. Black circles represent the experimental data, the red solid line is the total fit, and the blue, green, and magenta dashed lines correspond to individual decay components.