Using SOLO software package for classification of temperature dependent luminescence spectra

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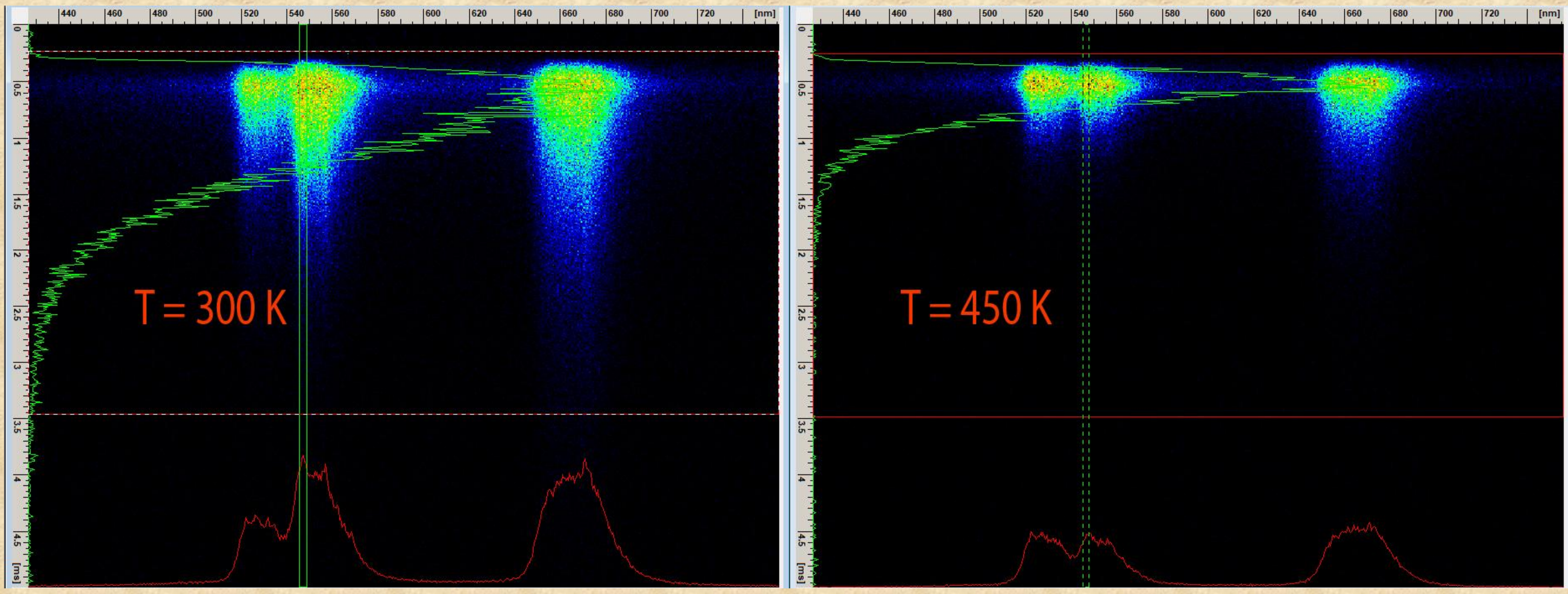
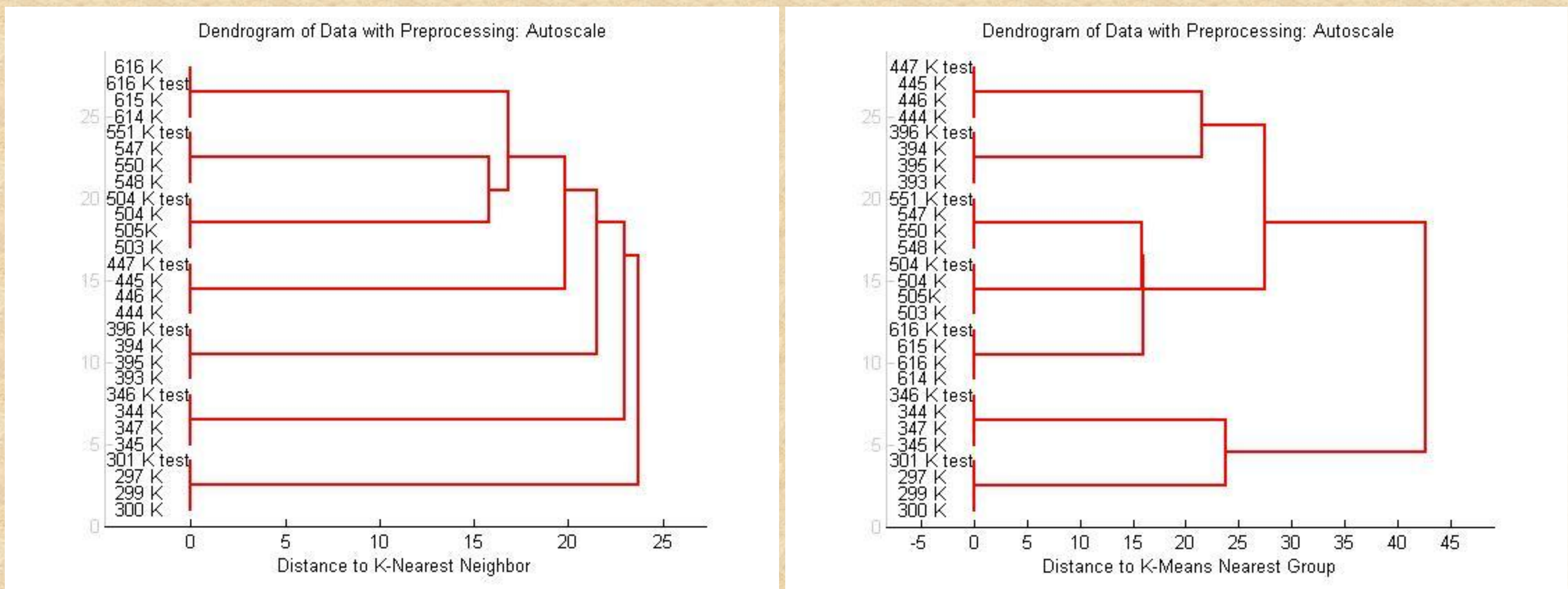
In this study we use SOLO software package (Version 8.8, Eigenvector Research Inc, USA) for classification of temperature dependent luminescence spectra of nanocrystalline Gd_2O_3 doped with Er and Yb. Material was synthesized by combustion method, as described in [1]. Our experimental setup is presented in detail in [2,3]. In [4,5] we have used Principal Component Analysis of luminescence spectra of thermophosphors; here, we use classification tools based on more sophisticated K-Nearest Neighbor and K-Means Nearest Group algorithms.



Streak images of Gd_2O_3:Er^{3+},Yb^{3+} excited at 980 nm, at different temperatures. Images are presented in pseudocolor where different colors correspond to different intensities. Vertical axis corresponds to time, here it is 5 ms from the start to the end of streak image. Horizontal axis corresponds to wavelengths of optical emisssion.



Classification results (shown as dendrograms) of luminescence spectra of Gd_2O_3:Er^{3+},Yb^{3+} at different temperatures using K-Nearest Neighbor and K-Means Nearest Group algorithms are shown in Figure 1. Although dendrograms are different, the groups determined by both methods are the same; moreover, the test luminescence spectra are also classified in temperature groups where they belong. So, the machine could be trained to differentiate spectral data obtained on different temperatures.

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