**Application of wavelet transform in filtering method for denoising THz pulsed spectroscopy signals**

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**Abstract.** Wavelet was used to filter terahertz signals. The results show that wavelet filtering method are competitive to traditional method.

**Keywords:** wavelet transform, terahertz time domain spectroscopy, glucose

Terahertz time domain spectroscopy (TDS) can be used for disease diagnosis, product quality control, explosive detection, and etc. The THz TDS pulse signal, which is obtained from TDS, contains optical properties of the sample. When signals are being recorded, noises are being merged into signals in the same time. Noises influence the signal waveform, which leads to the unclear spectrum. It is hard to get useful information from signals in such circumstances. To denoise a THz TDS pulse signal, wavelet transform can be used as a filtering method.

Since in biomedical sphere there are many different THz TDS pulse signals with complex conditions, an optimal wavelet filtering set, which includes a wavelet basis, a threshold and a decomposition order, is needed. In our research, a MATLAB program has been made to evaluate the compatibility of different wavelet bases and thresholds with a certain glucose measurement signal. A well filtered THz TDS pulse signal was then carried out to be compared with its another filtered signal, which was gotten by a traditional filtering method.

Other sample signals were afterwards processed by the MATLAB program too. And the filtered sample signals were also compared with their traditionally filtered signals. The results illustrated that the wavelet transform can be used as a filtering technique for THz TDS pulse signals, and the wavelet filtering method is competitive to the traditional filtering method. The method has a huge advantage since a lot of time can then be saved from getting optimal filtered THz TDS pulse signals.