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### 基于形态小波的烟草尼古丁含量近红外光谱检测

#### Near-infrared spectrum detection of tobacco nicotine content based on morphological wavelet

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中文关键词: [近红外光谱](#),[模型](#),[优化](#),[形态小波](#),[烟草](#),[尼古丁](#)

英文关键词: [near-Infrared spectroscopy](#) [models](#) [optimization](#) [morphological wavelet](#) [tobacco](#) [nicotine](#)

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中文摘要:

为了提高烟草尼古丁含量的测定精度, 该文将基于形态小波的近红外光谱去噪方法应用于烟草的一阶导数近红外光谱数据处理中, 给出了方法的原理和步骤, 评估了该方法的去噪效果; 用处理后的光谱计算了烟草中的尼古丁含量, 并与小波变换方法的处理结果进行了对比分析。结果表明: 形态小波作为一种非线性小波, 兼顾数学形态学的形态特征和小波的多分辨率特性, 在去噪的同时具有良好的光谱细节保留能力, 能有效地保留光谱的有用信息。与小波软阈值方法相比, 检测结果中预测集的决定系数 $r^2$ 由0.9877提高到了0.9931, 其均方根误差RMSEP由0.0539降到了0.0492。研究结果为提高利用近红外光谱测定烟草尼古丁含量的分析精度和模型的稳健性提供了参考。

英文摘要:

In order to improve the accuracy of non-destructive detection of nicotine content of tobacco, a novel method was proposed to get the pretreatment of near-infrared (NIR) spectrum based on morphological wavelet de-noising. The principle and steps of the method were given. The first derivative NIR spectrum of tobacco was served as the target to evaluate the application effect of this method. Then the tobacco nicotine content was calculated based on the de-noised spectrum, and it was compared with the result from wavelet method. Experimental results show that as a kind of nonlinear wavelet, morphological wavelet has both the morphological characteristic of mathematical morphology and the multi-resolution feature of wavelet. It had good performance in keeping details of spectrum and resisting noises. Compared to wavelet threshold method, it had more ideal effects that the correlation ratio ( $r^2$ ) of the prediction set was improved from 0.9877 to 0.9931, and the RMSEP reduced from 0.0539 to 0.0492. The method can be a reference for improving the accuracy of the detection of nicotine content of tobacco and the robustness of model by using near infrared spectroscopy.

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