

基于近红外技术的植物染料与化学染料快速鉴别方法

Rapid identification method of plant dyes and chemical dyes based on near infrared technology

摘要

目前尚未有可针对织物染色纺织品进行快速、准确且无破坏检测的鉴定方法，为此，我们引入了近红外光谱（NIR）分析技术。通过近红外光谱仪采集多种植物染与化学染棉织物的光谱图像，结合 SIMCA 方法建立植物染与化学染棉织物的近红外定性鉴别模型；采用 PLS1 方法（偏最小二乘法）与化学定量方法相结合得到预测模型。从而从优筛选光谱区间和预处理方法，通过过程中优化建模参数，从而最终建立最佳模型。经验证，染料定性鉴别模型对天然染料与合成染料染色的纺织品识别率达 80% 以上，可实现对染色织物染料的快速而准确的鉴别；染料定量预测模型对针对混合染色染料含量预测较为准确，可以进行染料各组分含量快速准确的预测工作。

关键词：近红外；定性鉴别；定量分析；快速预测

ABSTRACT

At present, there is no rapid, accurate and nondestructive testing method for textile dyeing. Therefore, NIR analysis technology is introduced. The spectral images of various plant dyed and chemical dyed cotton fabrics were collected by near-infrared spectrometer, and the qualitative identification model of plant dyed and chemical dyed cotton fabrics was established by combining SIMCA method; the prediction model was obtained by combining PLS1 method (partial least square method) and chemical quantitative method. So we can optimize the spectral range and pretreatment method, optimize the modeling parameters in the process, and finally establish the best model. After verification, the recognition rate of the qualitative identification model of dyes for textiles dyed with natural dyes and synthetic dyes is more than 80%, which can realize the fast and accurate identification of dyes for dyed fabrics; the quantitative prediction model of dyes is more accurate for predicting the content of mixed dyes, which can carry out the fast and accurate prediction of the content of dye components.

Key words: near infrared; qualitative identification; quantitative analysis; rapid prediction

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