Synopsis of Original Research Paper

Non destructive Analysis of Free and Bonded Water in Human Hair by Near Infrared Spectroscopy

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Near-infrared (NIR) diffuse reflectance (DR) spectra in the 12000-4000 cm-1 region were measured for keratin powder. At the initial stage of NIR measurement the keratin powder contained some water. The sample was placed in a vacuum oven at 50˚C for 30 minutes and then its spectrum was measured. After that the sample was kept in the oven at 50˚C for 5 minutes and then a spectrum was collected again. In this way 11 spectra were obtained. We analyzed two spectral regions, the 7050-6000 and 5350-4090 cm^{-1} regions, where bands due to free and bound water are expected to appear. For example, in the latter region we found a band at ~5180 cm^{-1} due to weakly hydrogen-bonded free water and a band at 5050 cm^{-1} ascribed to the overlap of strongly hydrogen bonded water and bound water. Probably, by taking the intensity ratio of these two bands, one may be able to explore the relative variation of free and bound water in keratin. The NIR spectra of keratin powder are so close to those of human hair, so that one may use the same technique to estimate the relative contents of free and bound water in human hair.