

Rapid Discrimination of Porcine and Tilapia Fish Gelatin by Fourier Transform Infrared- Attenuated Total Reflection Combined with 2 Dimensional Infrared Correlation Analysis

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Abstract : Gelatin, a purified protein derived mostly from porcine and bovine sources, is used widely in food manufacturing, pharmaceutical, and cosmetic industries. However, the presence of any porcine-related products are strictly forbidden for Muslim and Jewish consumption. Therefore, analytical methods offering reliable results to differentiate the sources of gelatin are needed. The aim of this study was to differentiate the sources of gelatin (porcine and tilapia fish) using Fourier transform infrared- attenuated total reflection (FTIR-ATR) combined with two dimensional infrared (2DIR) correlation analysis. Porcine gelatin (PG) and tilapia fish gelatin (FG) samples were diluted in distilled water at concentrations ranged from 4-20% (w/v). The samples were then analysed using FTIR-ATR and 2DIR correlation software. The results showed a significant difference in the pattern map of synchronous spectra at the region of 1000 cm^{-1} to 1100 cm^{-1} between PG and FG samples. The auto peak at 1080 cm^{-1} that attributed to C-O functional group was observed at high intensity in PG samples compared to FG samples. Meanwhile, two auto peaks (1080 cm^{-1} and 1030 cm^{-1}) at lower intensity were identified in FG samples. In addition, using 2D correlation analysis, the original broad water OH bands in 1D IR spectra can be effectively differentiated into six auto peaks located at 3630 , 3340 , 3230 , 3065 , 2950 and 2885 cm^{-1} for PG samples and five auto peaks at 3630 , 3330 , 3230 , 3060 and 2940 cm^{-1} for FG samples. Based on the rule proposed by Noda, the sequence of the spectral changes in PG samples is as following: NH_3^+ amino acid > CH_2 and CH_3 aliphatic > OH stretch > carboxylic acid OH stretch > NH in secondary amide > NH in primary amide. In contrast, the sequence was totally in the opposite direction for FG samples and thus both samples provide different 2D correlation spectra ranged from 2800 cm^{-1} to 3700 cm^{-1} . This method may provide a rapid determination of gelatin source for application in food, pharmaceutical, and cosmetic products.

Keywords : 2 dimensional infrared (2DIR) correlation analysis, Fourier transform infrared- attenuated total reflection (FTIR-ATR), porcine gelatin, tilapia fish gelatin

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