1. Jarvis R M et al 2004 Surface-enhanced Raman spectroscopy for bacterial discrimination utilizing a scanning electron microscope with a Raman spectroscopy interface Anal. Chem. 76 5198–202
2. Probing single molecules and single nanoparticles by surface-enhanced Raman scattering

Abstract

It was recognized that Raman spectra can reflect the molecule structure. However Raman scattering effect is a weak process, and It includes qualitative analysis and quantitative analysis in Raman spectroscopy. Due to the low signal-to-noise ratio of the Raman spectrum in the trace detection, the signal may be influenced by the background noise, the other unknown components in the system and the stability of the Raman instrument. It’s challenging to use Raman spectra for quantitative analysis.

For this reason, surface-enhanced Raman scattering (SERS) spectroscopy has grown rapidly and has been a powerful analysis tool in physics, analytical chemistry, materials science, surface science and life sciences. This paper explained SERS spectroscopy processing and identification including spectral preprocessing, feature extraction, feature classification (qualitative) and mathematical modeling (quantitative) based on neural networks, Compared to the models proposed in other literature, accuracy and model scale has been improved.

1.Introduction

Surface-enhanced Raman scattering (SERS) is a phenomenon first observed in 1973. One of the main challenges for Raman spectroscopy in applications is that the auto-fluorescence intensities which are excited by the laser light source, are superimposed in the Raman bands, so that the Raman signal intensity is only about 10−8 times the original excitation intensity.[1] In 1997 single-molecule SERS was observed, which demonstrated that the signal strength of Raman scattering can rival the fluorescence.[2] For the rapid development of SERS