

Raman Spectroscopy in Bone Sample: The Effect of Florescence

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Executive Summary

Raman spectroscopy is design to show the components of unknown sample. The sample is analyzed by a computer. Everything that is done is controlled by the computer. Before running the microscope, the microscope has to be centered so the machine could be warm up. It takes a few minutes for the microscope to warm up. The coverslips are cleaned with ethanol in order to avoid contamination of the sample. When the sample is place inside the stage of the microscope, then is centered with lent of the microscope. A specific place of the sample is going to be shot by the laser. The laser shots the sample as many times as the one performing the sample wants. It only takes a few minutes in order to the spectrum to give the components of the unknown sample.

In the experiment that was perform by using the Raman Spectra helped to seen what the components of a chicken bone. The small piece of the bone was place in a clean coverslip and was analyze by the microscope. The sample was shot 32 times by the laser. At a certain time and place in the bone. The first spectrum that was given by the Raman Microscope was affect by the presence of fluorescence in the light. This was the main problem when performing the experiment. When the spectrum was given the Raman peaks were not understandable and were not very comprehensive. The method that was used to reduce the effect of fluorescence was by changing the times and time the laser shot the sample. When the sample was run again the spectrum that was giving was more comprehensible. The Raman peaks were cleaner and the components were comparing to other materials that were already save in the computer. The Raman microscope is a very useful machine that can help discover what identity of unknown samples by giving its components.

Abstract

This research paper explains the effect of Raman Spectroscopy in powdered bone and in different materials. In this experiment, it was visible the different components of the bone sample. Also, it was used other samples in the experiment. The samples were each expose to the Raman Effect at different exposure time. This experiment helped to see the bone sample components at a microscopic level. This experiment was held to see the bone components and how to reduce the fluorescence effect in the sample. There are many ways to reduce the effect of florescence .

Introduction

The bone is composed of many different materials. These are some of the minerals that compose the bone in general; calcium, collagen, and phosphate. It is also made of inorganic and organic compounds. The human body is composed of 206 bones. The bone gives the support and shape to the body. The human body has all types of different bones that vary that vary in their size and shape. The female bones are different from male bones. The difference from female and male bones is the females have a bigger waist. The body also has axial and appendicular bones. The axial bones protect the major organs of the body. The axial bones are composed of eighty bones. The ribs cage, skull and vertebral Colum are the main axial bones. The appendicular bones are joined together. The appendicular bones are; fingers, shoulders, and knees.

There are two main things that can harm the bones. One of them is osteoporosis. This is an illness that affects the bone nutrients. It lacks the bone from getting its nutrients. The bone will get thinner and will brake easier. The other kind of illness is osteopetrosis. The effect of this

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illness is that is that the bone will gain an excessive amount of nutrients. The bone will get thicker and stronger and will cause the bone also to break because of the growing rate of the bone.

The bones in general go through a process of formation. This process is called the bone recycling model. In this cycle, the bone reconstructs and forms new bone. This process occurs with the help of three main cells. A cell named osteoclast eats the part of the bone that is damaged. This process is called the resorption process. When the osteoclast cell finishes eating the damaged part of the bone, another cell comes and reconstructs the part of the bone that is missing. This constructive cell is called osteoblast. What this cell does is that it produces new bone. This is called the formation phase, which takes from four to six months to complete. The first phase is the old bone, and then is the cement line and then is followed by the new bone. The major cell is the osteocyte which tells the other two cells what to do. This cycle happens every time you damage your bones.

Raman Spectroscopy has a theory that states, "The energy that enters the sample gives and gains energy. When the laser hits the sample, the laser goes through the sample. When this occurs, the energy that's transferred to the sample might gain or lose energy. This is caused due to the vibrations of the sample. The faster the molecules move the less energy that will be taken away. If the molecules move slower it will take more energy from the sample. The Raman microscope is used to identify the components of unknown samples. The information goes to a library and then it compares the information to other samples. The way that the components of the sample are identified is by the peaks of the graph that are given after the sample is finished being run in the microscope. The peaks of the graph play an important role in the results of the experiments because it tells what the sample components are. The effect of fluorescence in the

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sample damages the results of the sample. This is caused by the excessive presence of light while the sample is being shot by the laser. This effect caused the results of the unknown sample to be hard to understand. There are some ways to reduce and prevent florescence.

Materials and Methods

- Coverslip
(Where the sample is placed)
- Disposable wipes
(Are used to clean and the coverslips)
- Ethanol
(Is used to disinfect the coverslip to avoid contamination)
- Chicken hip bone (dried)
(The bone sample that is used for the experiment)

Problem

Fluorescence in Raman Spectroscopy affects the spectrum. Fluorescence is an emission process and causes some samples to give off a strong, broad emission when illuminated by the existence of laser. It affects the spectrum by giving weaker Raman peaks. There are some solutions that can be helpful to reduce the fluorescence effect. This effect can be reduced by adding to the sample plane carbon. This will reduce the amount of fluorescence that is transfer to the sample. This works by giving carbon off energy to the fluorescence that is affecting the sample. Other way to reduce fluorescence is by changing the time the sample is being exposed to the light of the laser. This can be change by changing the data before running the sample. Also, by changing the laser might help to reduce fluorescence. Checking the sample from impurities is a very helpful way. Impurities are one of the major sources of fluorescence. This can reduce by purifying the sample before running the sample. When the spectrum is given and it can be changed.

Experiment Set-up

The first thing that was performing during the experiment was to turn on the laser on. By turning on the laser it warmed up the engines from the microscope. The aliment of the laser is very important step in the experiment. This helped to center the laser of the microscope. The technique that was used during centering the laser was to be accurate when placing the dot in the middle. The next thing was to clean the cover slip with ethanol to avoid contamination. Then a piece of bone sample. When performing the experiment, the important things to consider are the following five; the source, sample stage, detector of sample, transducer, and inner face.

Result and Discussion

One part of the chicken bone was exposed a certain of times by the laser. It was exposed 4.0 seconds and was hit 32 times by the laser. The graph of the sample was affected by the effect of fluorescence. The graph was understandable and was hard to tell what the components were. The method that was used to reduce the fluorescence of the chicken bone was by changing the exposure time of the sample. When the sample of the chicken bone was run again, the Raman peaks were more understandable. The Raman peaks is what tell what the sample is composed of. The Raman peaks are in every shape and in different heights. The chicken bone was composed of different materials. Each peak represents each different that the bone is made of. The major component of the chicken bone was phosphorus. Raman Spectroscopy can be used in many other ways. Raman can be very useful to find the components of unknown samples. The future work that can be done is determining the components of the bone harm by osteoporosis and osteopetrosis. This is important because it can help prevent osteoporosis and osteopetrosis.

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