Abstract

In the forensic field, cases involving burned remains are difficult to solve either deliberately or due to an accident. The exposure temperature holds critical information which can help solve the case. First, the temperature can show if the victim is arsoned to cover up a murder. Second, by knowing the exposure temperature the suitable samples for DNA analysis can be found. Through DNA analysis the victim might be identified, as common methods fail due to the loss of most human material. However, DNA extraction is time-consuming and the sample is lost during the extraction process. Also, bones exposed to temperatures higher than 250 °C retain little to no DNA. Knowing the exposure temperature therefore is vital to find suitable samples.
In this research Raman spectroscopy is explored as a method of determining the exposure temperature. With Raman spectroscopy the chemical bonds of a sample can be measured non-invasively. As a bone is heated, its chemical structure changes according to the intensity of the heat. By using Raman spectroscopy, burnt bones could be divided by their Raman spectrum into three clusters of exposure temperatures and a transition region.
The first cluster is from room temperature to 200 °C. Then a transition region is measured at 250 °C. The second cluster is from 300 to 600 °C and the final cluster from 700 to 900 °C. In conclusion, due to the quick and non-invasive measurements of Raman spectroscopy, it shows to be a prominent method for determining the exposure temperature of burnt bones.