

Use of the RamanMicro 200 in the Identification of an Aerosol Nozzle Blockage



Modern Raman microscopy is being used in an ever-increasing number of application areas in a wide variety of analytical environments. These application areas include:

- identification of forensically-important samples such as single crystals, fibers, smears or paint fragments.
- product characterization where an understanding of the chemical distribution of the components of a material is required.
- the understanding and conservation of art objects, fabrics, building materials and other historically-important items.
- in research laboratories as an aid to the better understanding of existing or new materials, their properties and their manufacture.
- in trouble-shooting laboratories where industrial problems related to manufacturing, quality control, environmental issues, etc. are investigated. In many cases, these analyses involve the unambiguous identification of rogue materials which can turn up in unusual and unwanted places.

Identifying the cause of blockage in an aerosol nozzle is a common problem found in many products ranging from foodstuffs, paints, healthcare and medical equipment. The results of these blockages can be inconvenient, costly or even fatal.

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This application note describes how one company used the RamanMicro™ 200 Dispersive Raman Microscope to troubleshoot just such a problem. The visible image (x4 objective) of the blockage taken using the camera of the microscope is shown in Figure 1.

The current method of analysis of the blockage material is to remove it and identify it using an IR microscope. Since the blockage is slightly recessed into the nozzle it is not possible to analyze the sample *in-situ* using IR spectroscopy. The removal of the sample destroys its spatial integrity. It is of particular importance to identify the material that actually causes the blockage as opposed to the material that simply builds up behind the initial



Figure 1. Visible image (x4 objective) of the blockage taken using the camera of the RamanMicro 200.

blockage. Since Raman spectroscopy is a non-contact analytical technique, it is ideal for this type of *in-situ* analysis.

The RamanMicro 200 can be equipped with a range of different objectives, each giving a different area of analysis. In this case, a x20 objective was used, giving a 50 micron analysis area.

The resultant Raman spectra from the white surrounding polymer and the blockage are shown in Figures 2 and 3 respectively. The acquisition time for these spectra was 1 minute and the spectral resolution was 8 cm⁻¹. The Raman spectra from the two most likely materials to cause the blockage are shown in Figure 4. It is clear that the blockage is caused by Material 1.

The sample was turned over and the reverse side of the blockage analyzed using the same experimental conditions. The resultant spectrum was

also that of Material 1. Finally, the entire blockage was removed and analyzed in bulk. This also indicated that only Material 1 was present. The conclusion is therefore, that the initial blockage was caused by Material 1 and any subsequent build-up of material behind this blockage was of the same material.

Conclusions

Raman microscopy is a very useful analysis technique for the identification of physically small samples or small areas of larger samples. In particular, since it is a non-contact technique, it is very useful for providing *in-situ* analysis, or where the spatial integrity of the sample needs to be maintained.

The RamanMicro 200 offers the analyst all the benefits associated with:

- an easy-to-use visible microscope
- high quality Raman data from a straightforward point-and-scan instrument
- a full-range Raman spectrum which can be searched against either a commercial or user-generated spectral library
- an unambiguous material identification

Acknowledgements

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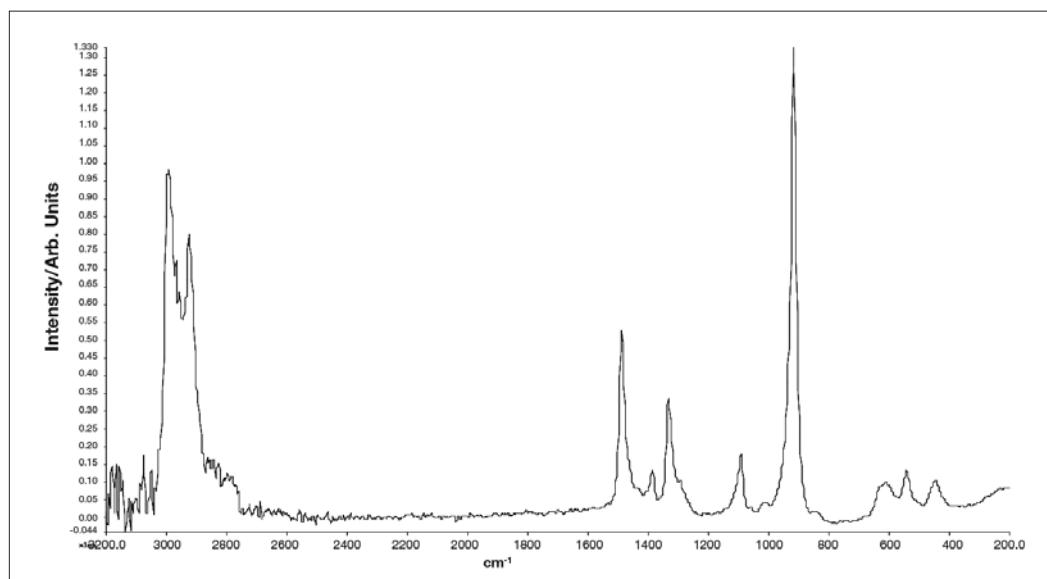


Figure 2. Raman spectrum of the white surrounding polymer.

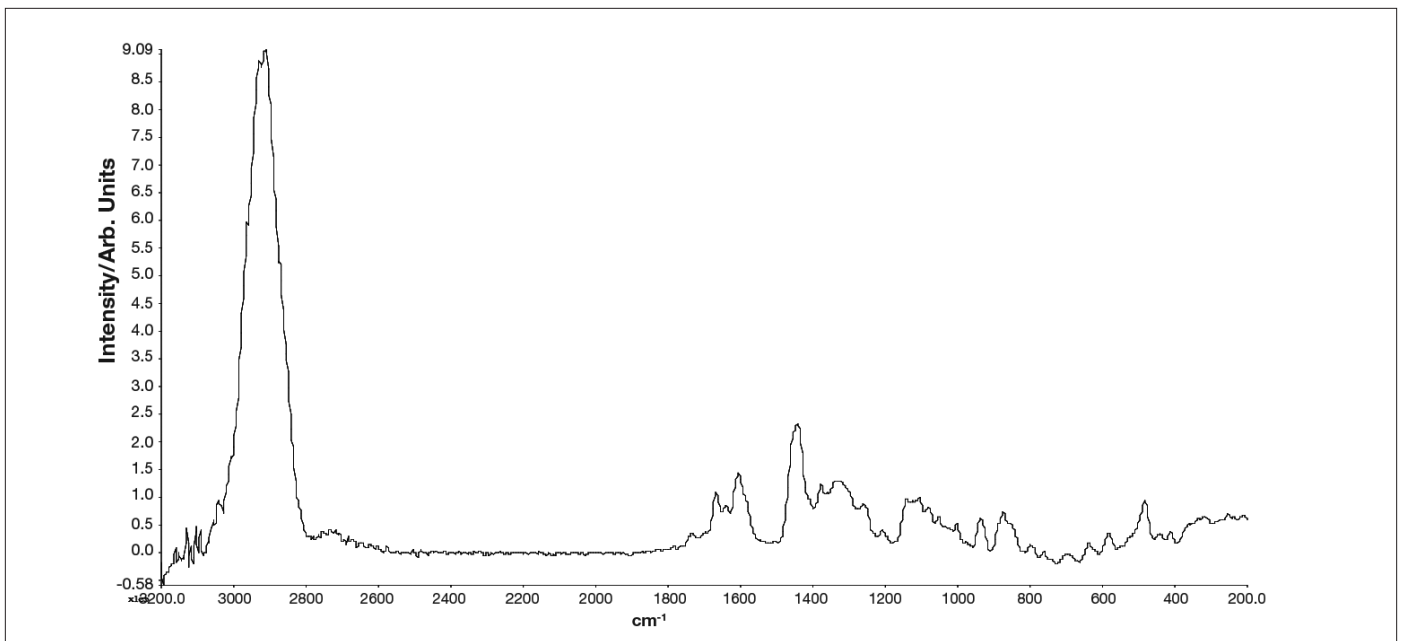


Figure 3. Raman spectrum of the blockage material.

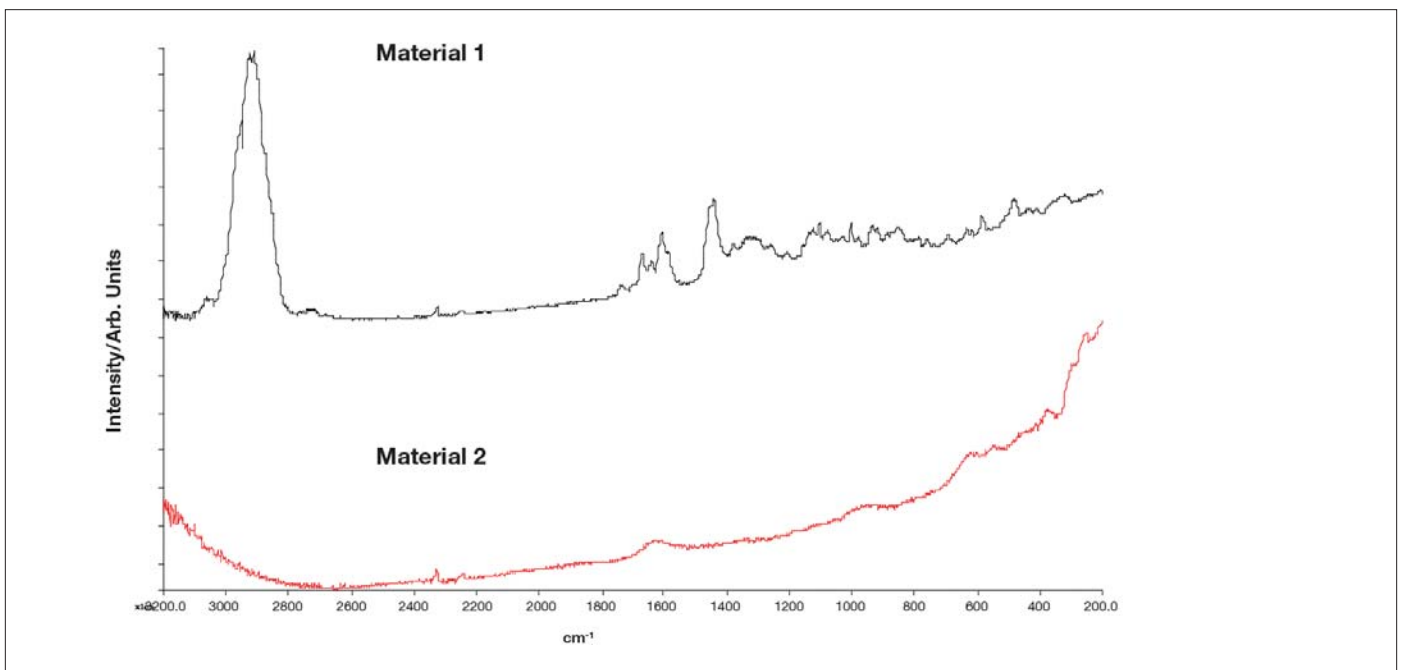


Figure 4. Comparison of the sample spectrum with the two most likely blockage materials shows that Material 1 is causing the blockage.

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