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Temperature effects on the Raman lineshape of cupric oxide thin films and nanowires SHRIVIDYA RAVI, ALAN KAISER, Victoria University of Wellington, CHRISTOPHER BUMBY, Industrial Research Limited — The Raman spectrum can be used as a fingerprint for a given material but the details of the Raman spectrum (e.g. the peak lineshape) can also impart considerable information about various environmental effects. In this study, we will describe the effects of heating on the Raman lineshape using a temperature-dependent model. Homogeneous heating (i.e. spatially uniform temperature) leads to symmetrically broadened lineshapes while asymmetric lineshapes can be associated with electron-phonon coupling in or phonon confinement effects. Recently, several groups have found that asymmetric lineshapes from nanoparticles and nanowires require an additional term that describes the inhomogeneous heating - temperature gradients within the sample - due to a gaussian laser beam. In our samples, phonon confinement does not play a role at all as nanowire dimensions are well above 20 nm. Hence, we have invoked a purely temperature-dependent model. This model has considerable flexibility as it can explain both the symmetrical and asymmetrical broadening of the lineshape. We have used it to describe and compare a thin film of cupric oxide (which mostly exhibits homogeneous heating effects) and a vertical forest of cupric oxide nanowires (which exhibit effects of inhomogeneous heating).

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