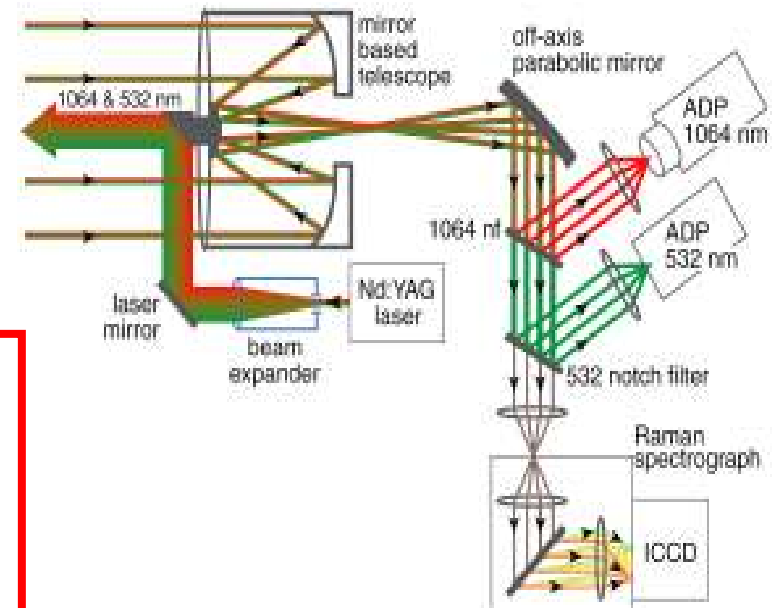


# Exploring the Surface Mineralogy and Atmosphere of Venus with a Combined Remote Raman Spectroscopy & Elastic Lidar System

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Science – Mineralogy, molecular gases & aerosols

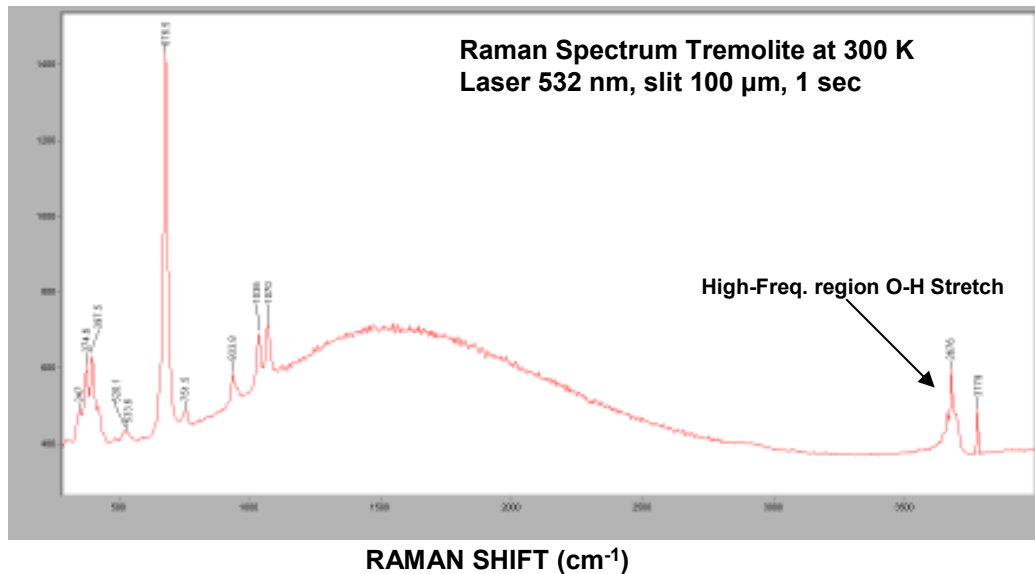
Technology: TRL 5

Deployment – **No** sample prep!

Remote Raman: Minerals to >100 m, Atm to >2.5 kms

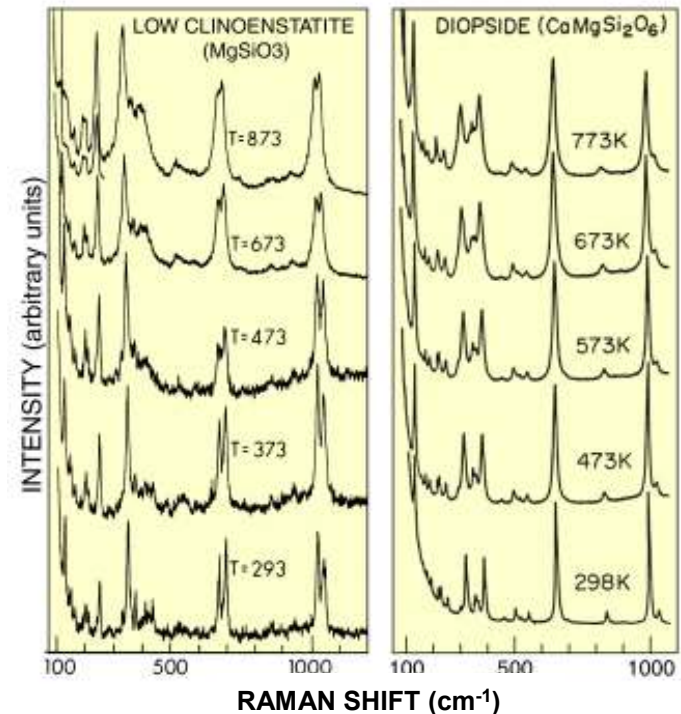
# Raman Spectra of Amphibole & Pyroxenes

In the past, if water was present on Venus some of the amphiboles may still be stable on the planet surface. Amphiboles, other hydrous minerals and their alteration products can easily be detected from their finger-prints in the Raman spectra .



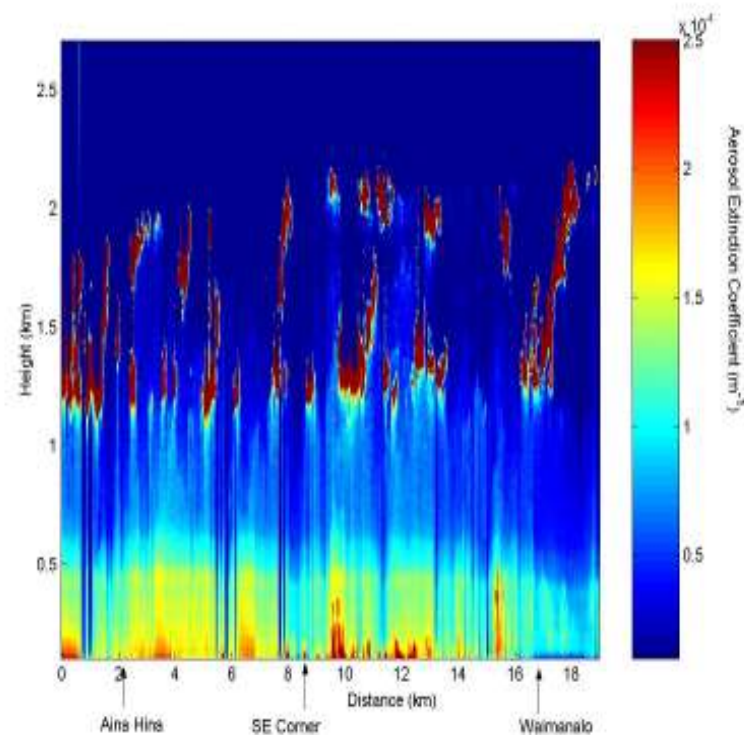
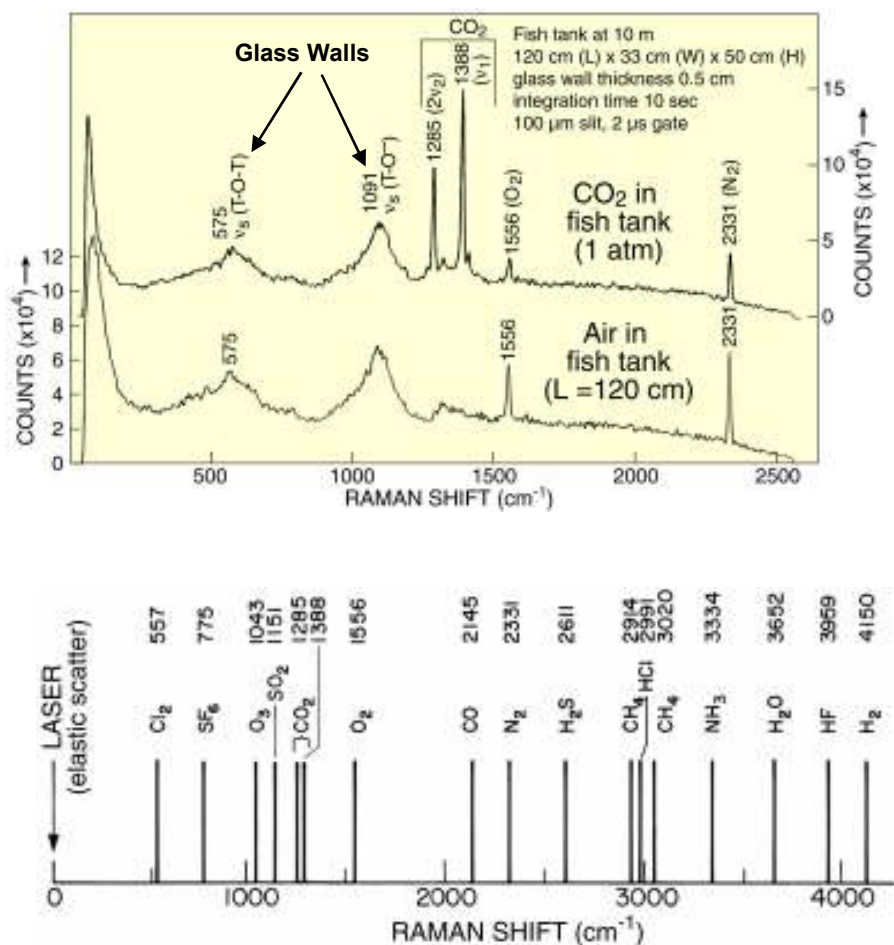
Heated at 1073 K (CO<sub>2</sub> & N<sub>2</sub> atm) over 3 yrs period.  
 $\text{Ca}_2\text{Mg}_5\text{Si}_8\text{O}_{22}(\text{OH})_2 = 2\text{CaMgSi}_2\text{O}_6 + 3\text{MgSiO}_3 + \text{SiO}_2 + \text{H}_2\text{O (gas)} \dots\dots\dots(1)$   
 Tremolite (Amphibole) (diopside + Enstatite) + high T silica phase + Water (v) (Dp40En60)

(Johnson and Fegley (2003) *Icarus* 164, 317–333)



Venus Surface P = 92 Atm., T = 723-753K  
 At Venus surface the Raman lines of minerals will be sharp and distinct.

# Combined Remote Raman & Elastic Lidar Data



Aerosol scattering coefficient derived from lidar data around SE Oahu. Clouds are shown in dark values (Sharma et al., 2003). Laser 532 nm, 12 mJ/pulse, 20 Hz.