

Supplemental Material

Artificial Intelligence Assisted Mid-Infrared Laser Spectroscopy in situ Detection of Petroleum in Soils

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The meaning of the abbreviations are: sand (sand), montmorillonite (mont), bentonite (bent), brown soil, red soil, and -PX % (contains traces of oil and its value in percentage weight to weight).

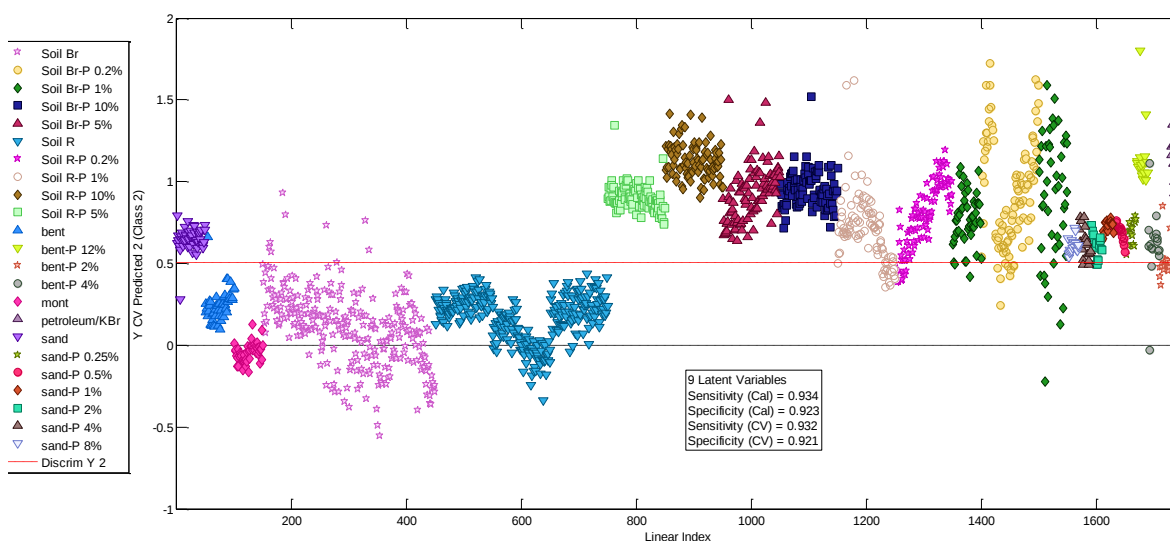


Figure S1. PLS-DA model of calibration for the discrimination of different types of soils with and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

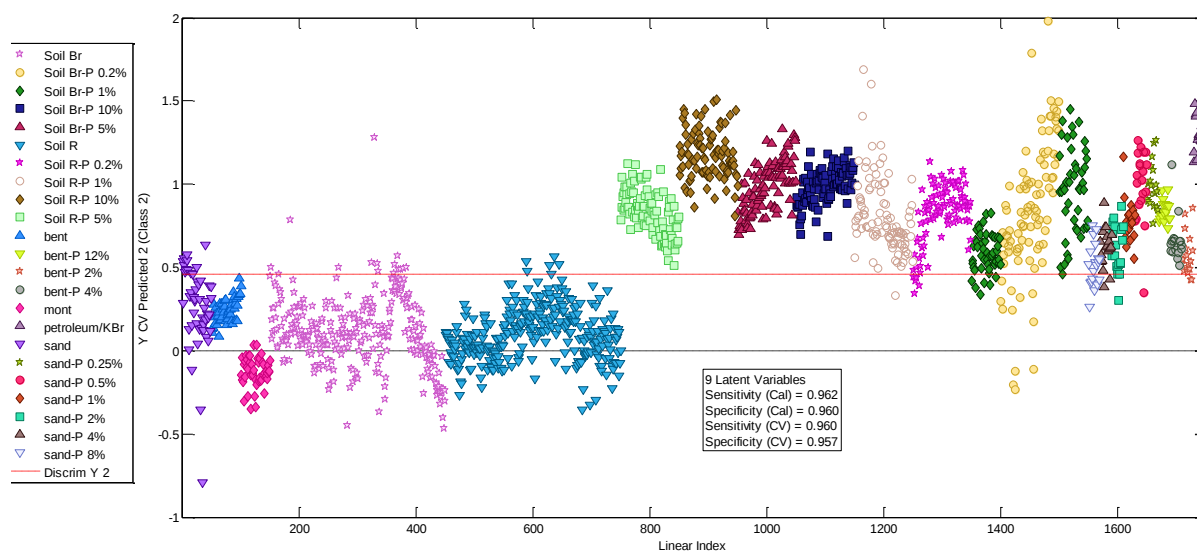


Figure S2. Improved PLS-DA model of calibration for the discrimination of different types of soils with and without petroleum traces, using the spectral region from 1300 to 1600 cm^{-1}

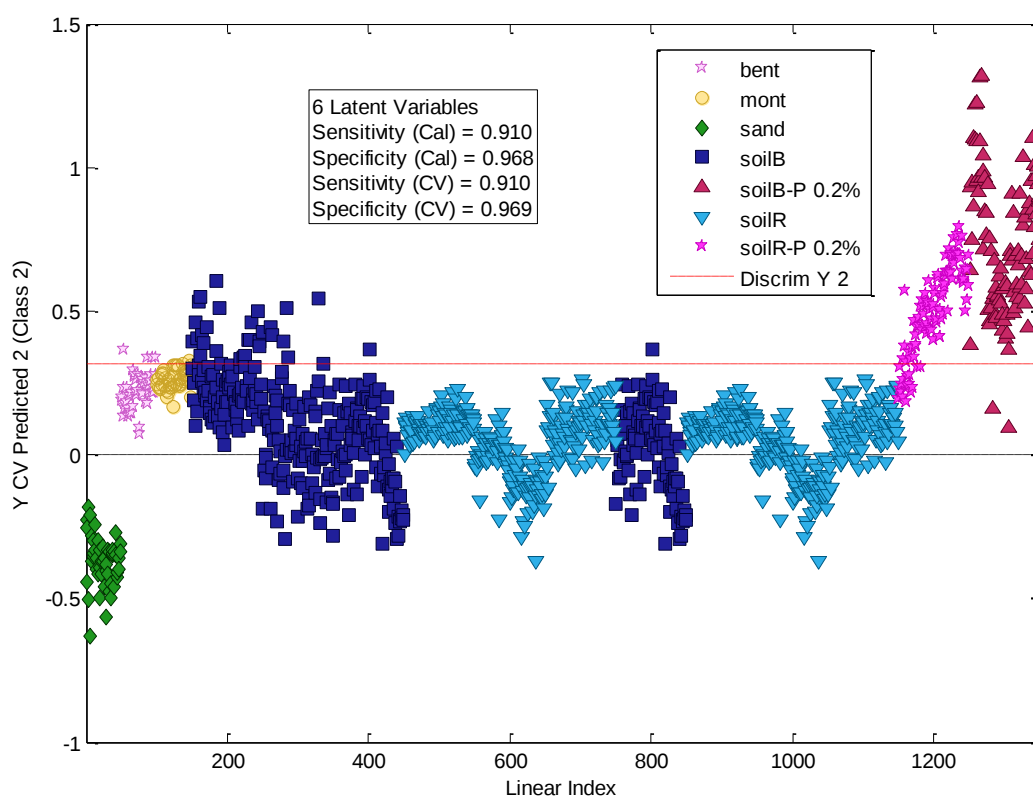
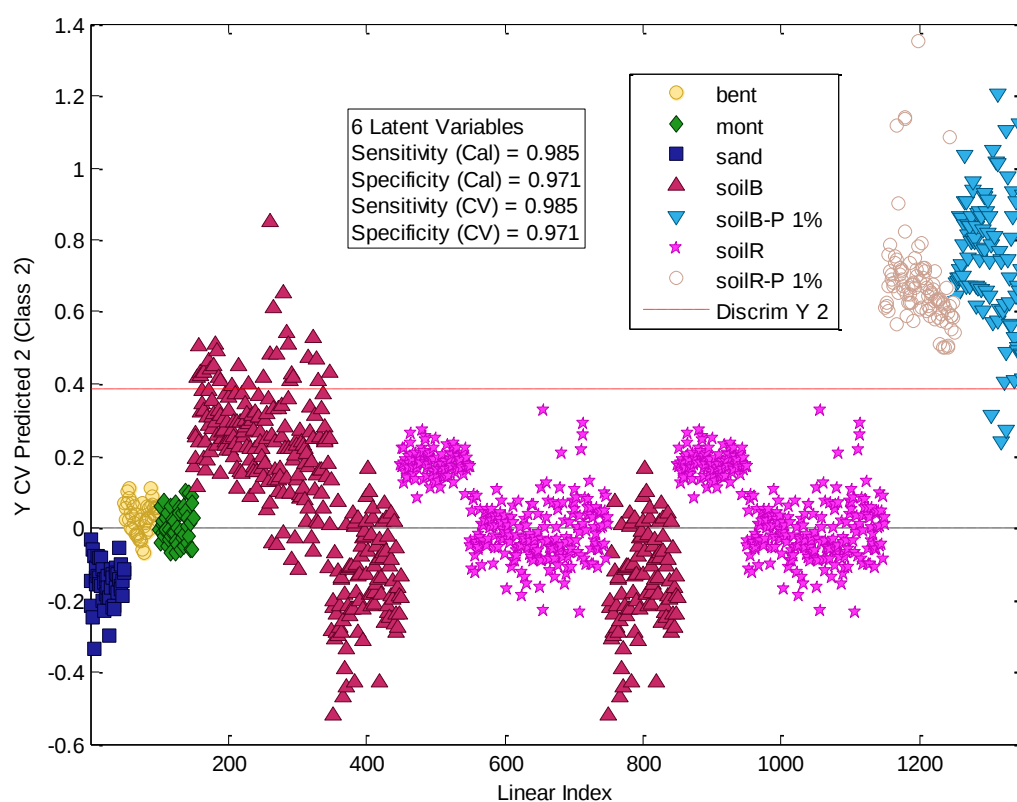


Figure S3. PLS-DA model of calibration for the discrimination of soil red and brown with 0.2 % of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .



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31 **Figure S4.** PLS-DA model of calibration for the discrimination of soil red and brawn with 1 % of petroleum
 32 and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

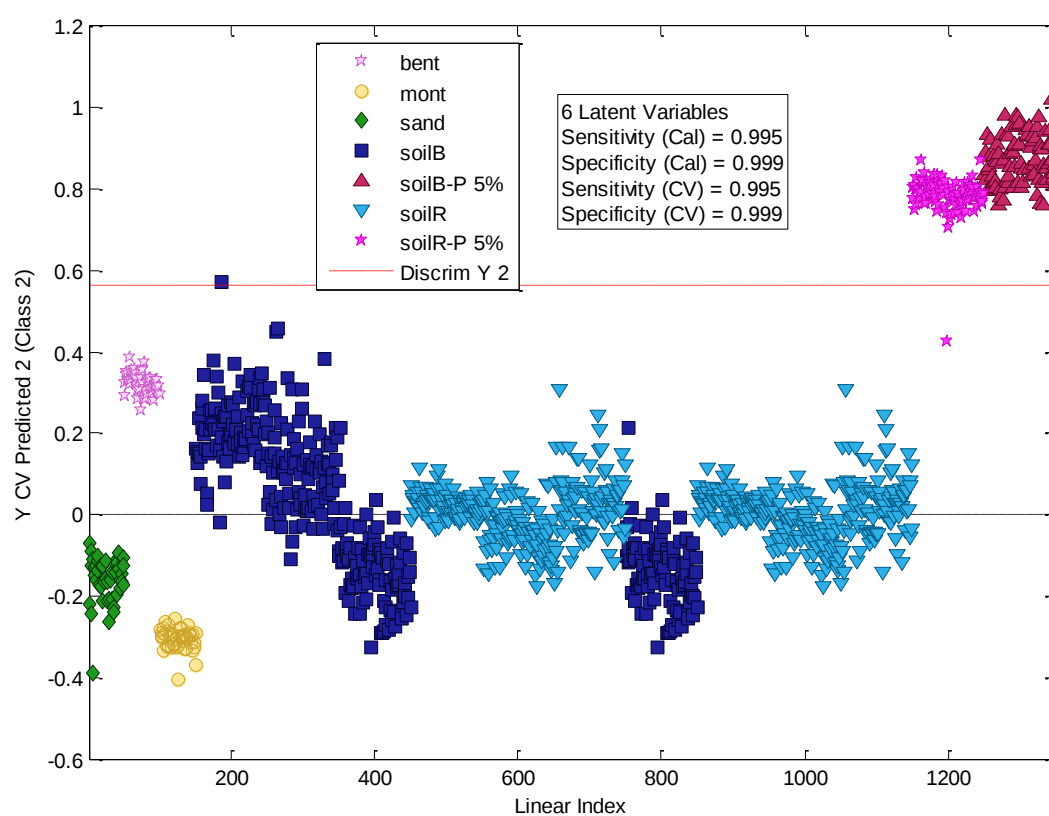


Figure S5. PLS-DA model of calibration for the discrimination of soil red and brawn with 5% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

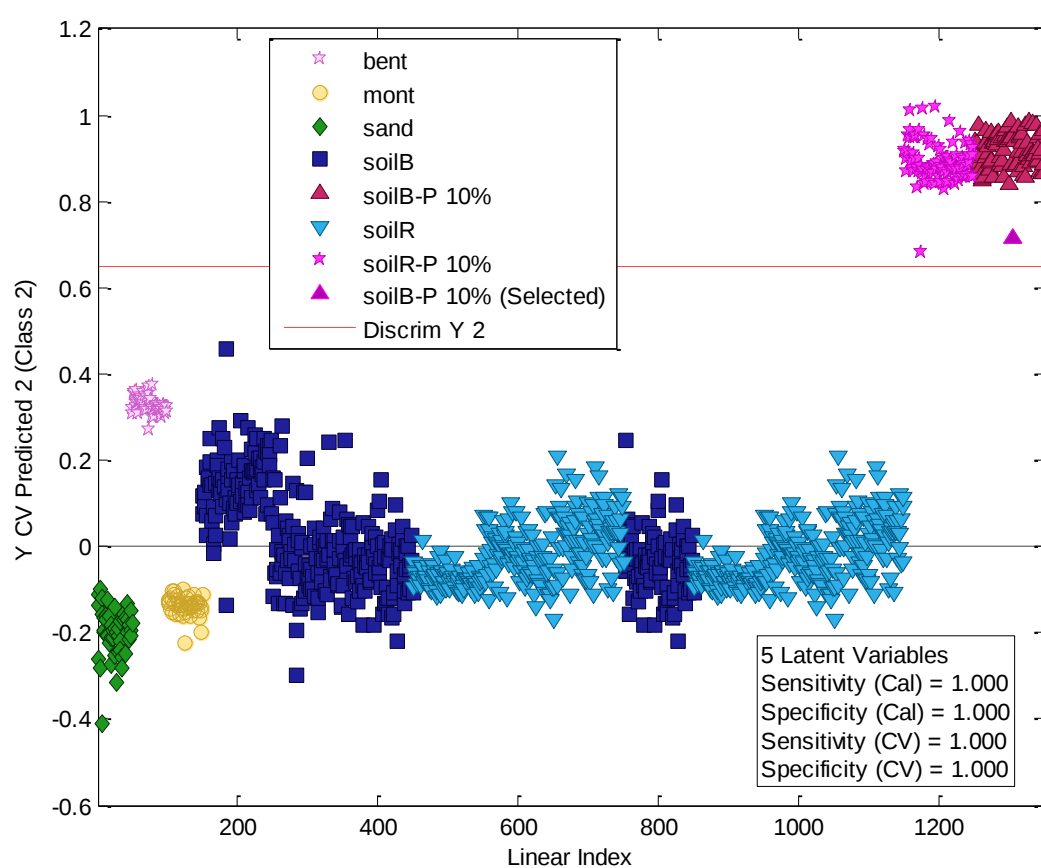


Figure S6. PLS-DA model of calibration for the discrimination of soil red and brawn with 10% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

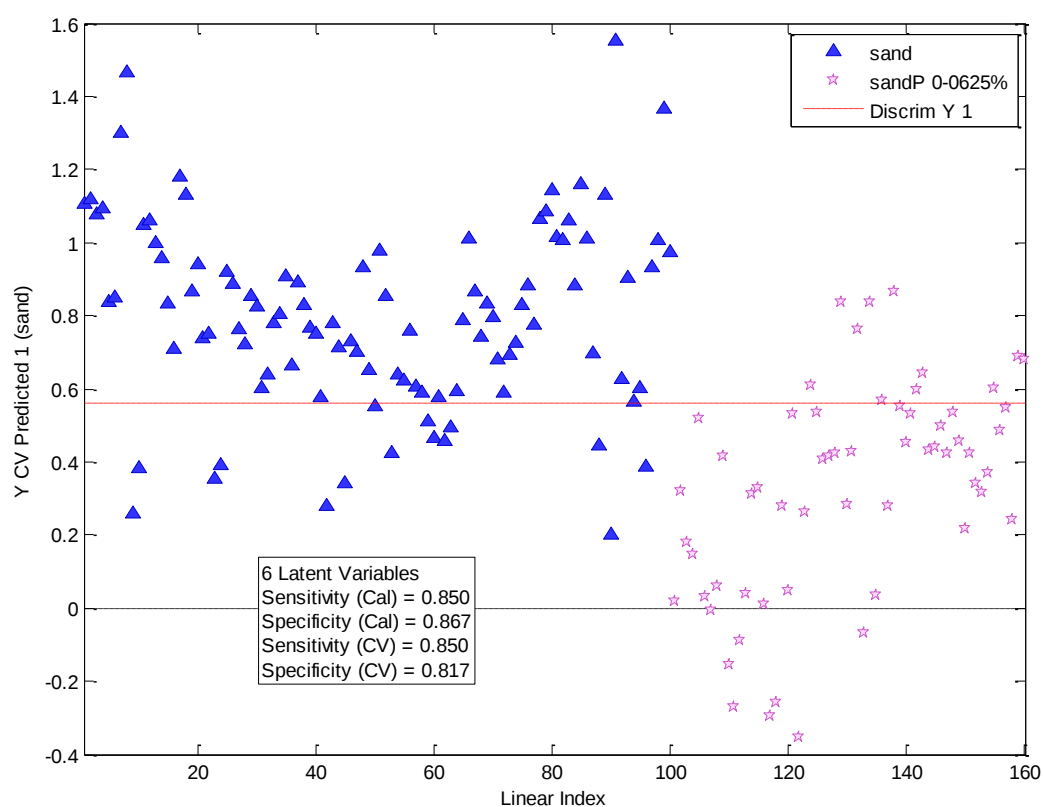


Figure S7. PLS-DA model of calibration for the discrimination of sand with 0.0625% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

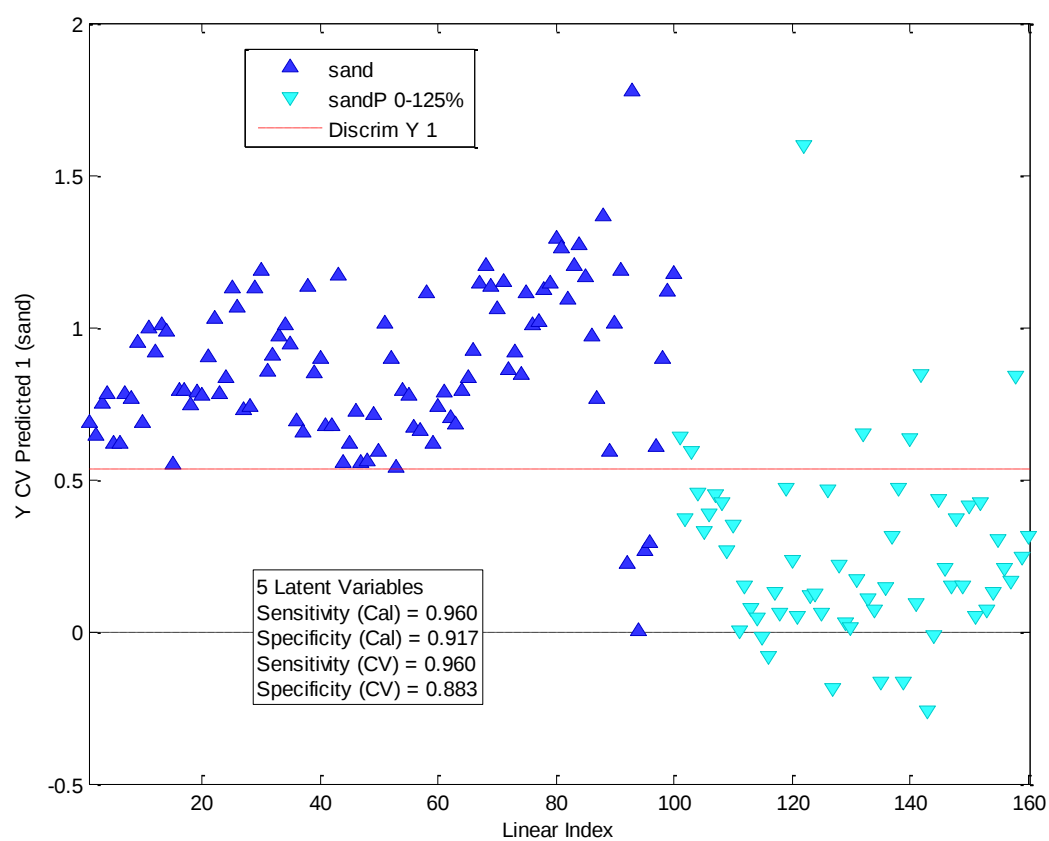
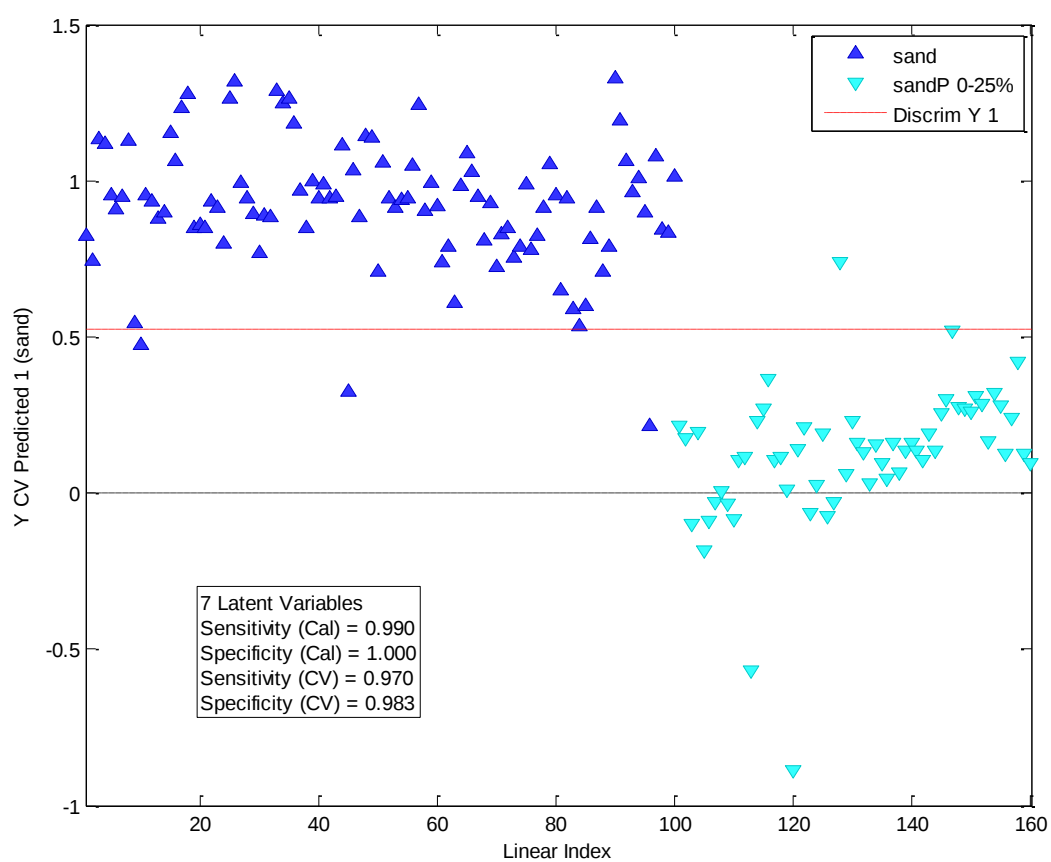


Figure S8. PLS-DA model of calibration for the discrimination of sand with 0.125% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .



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46 **Figure S9.** PLS-DA model of calibration for the discrimination of sand with 0.25% of petroleum and without
 47 petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

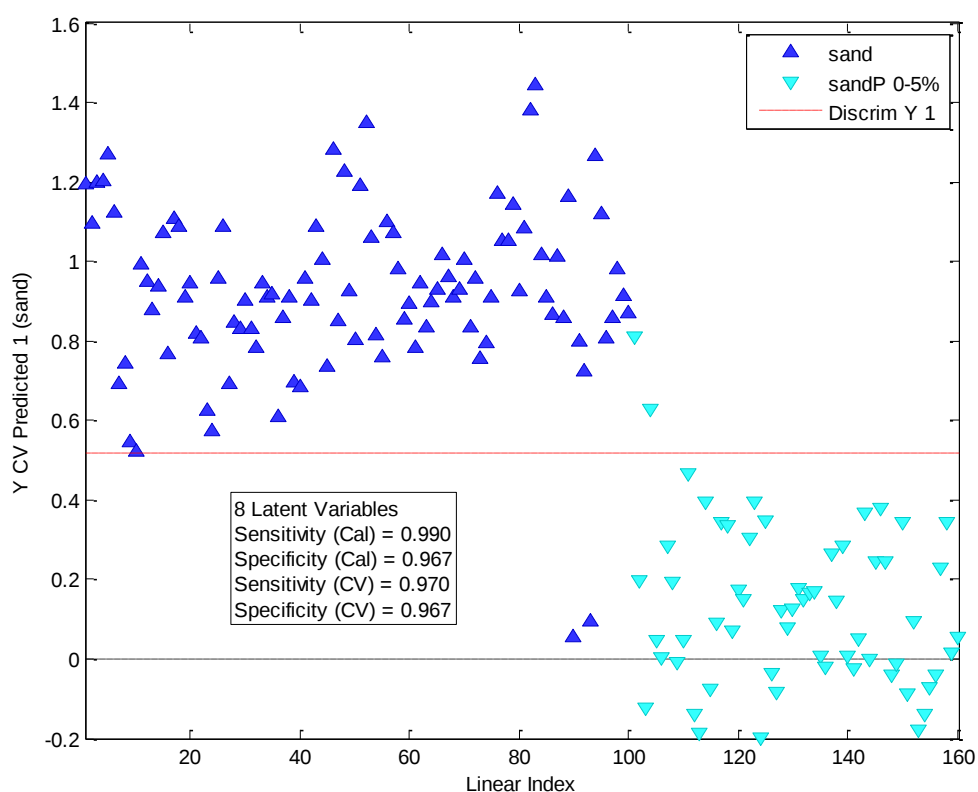


Figure S10. PLS-DA model of calibration for the discrimination of sand with 0.5% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

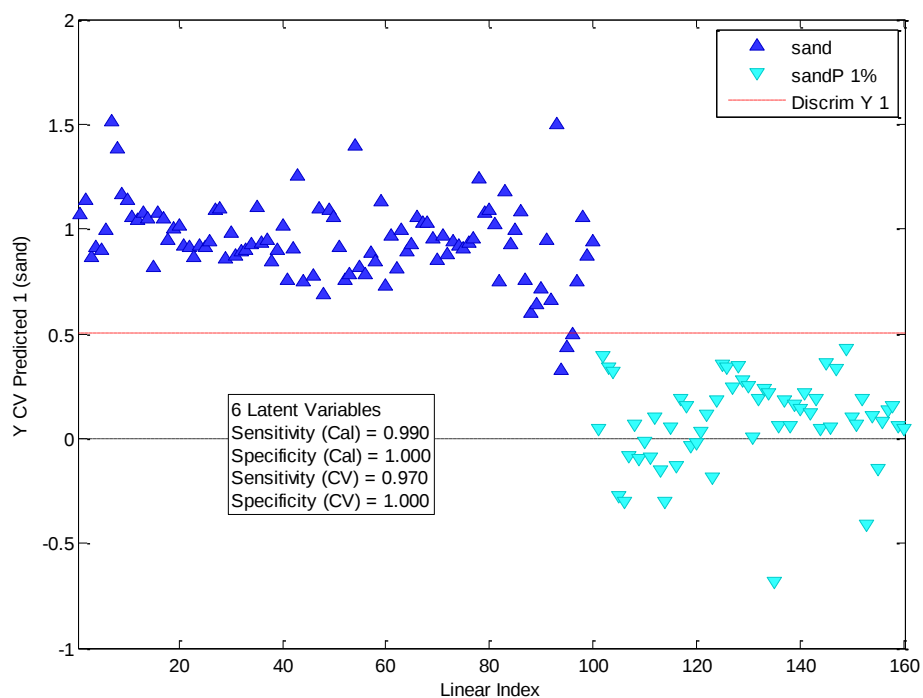
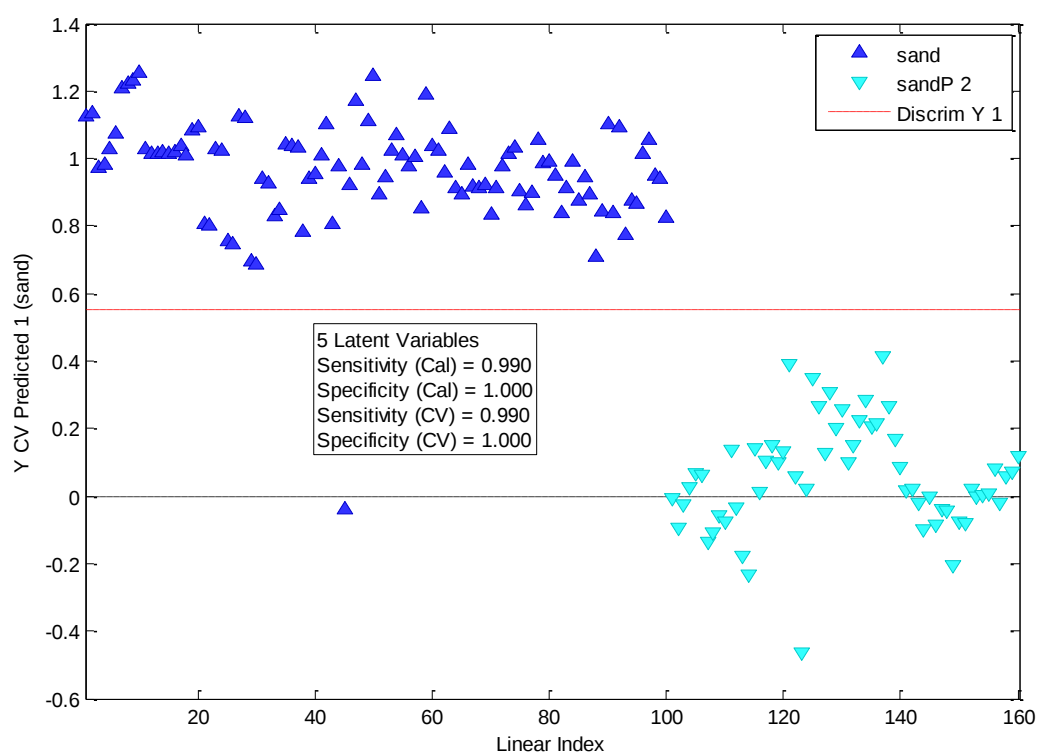


Figure S11. PLS-DA model of calibration for the discrimination of sand with 1% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .



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55 **Figure S12.** PLS-DA model of calibration for the discrimination of sand with 2% of petroleum and without
 56 petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

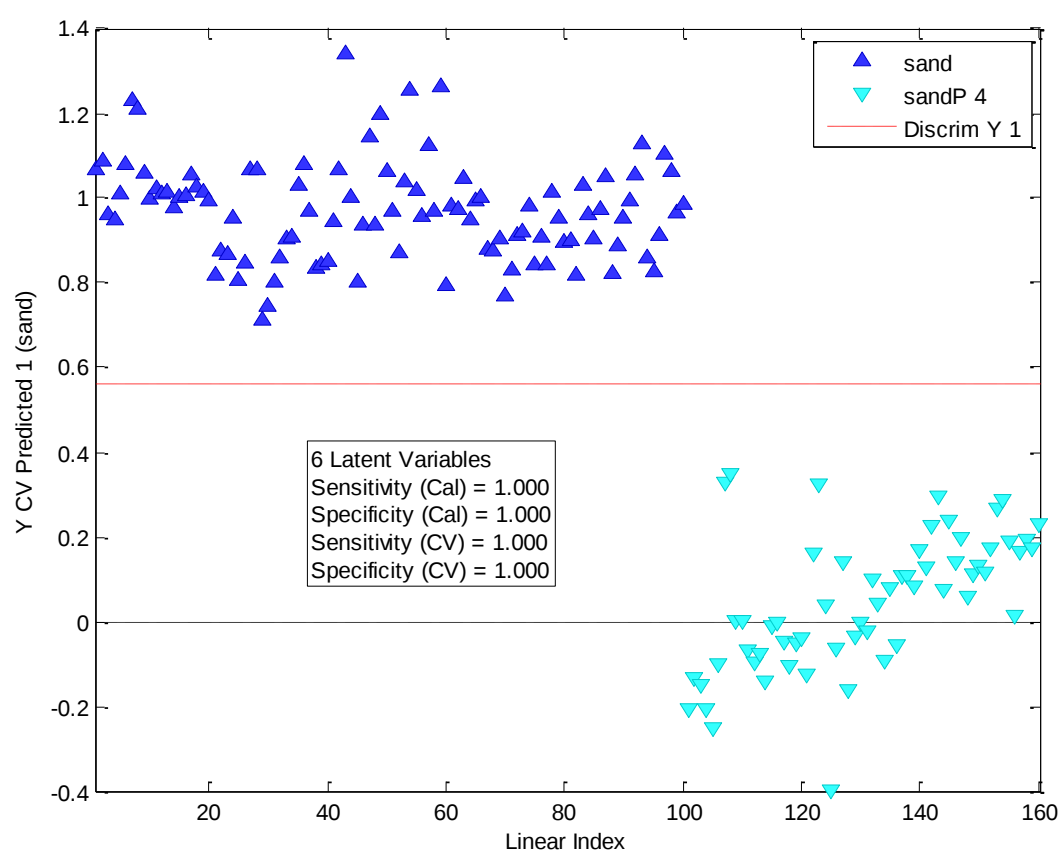


Figure S13. PLS-DA model of calibration for the discrimination of sand with 4% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .

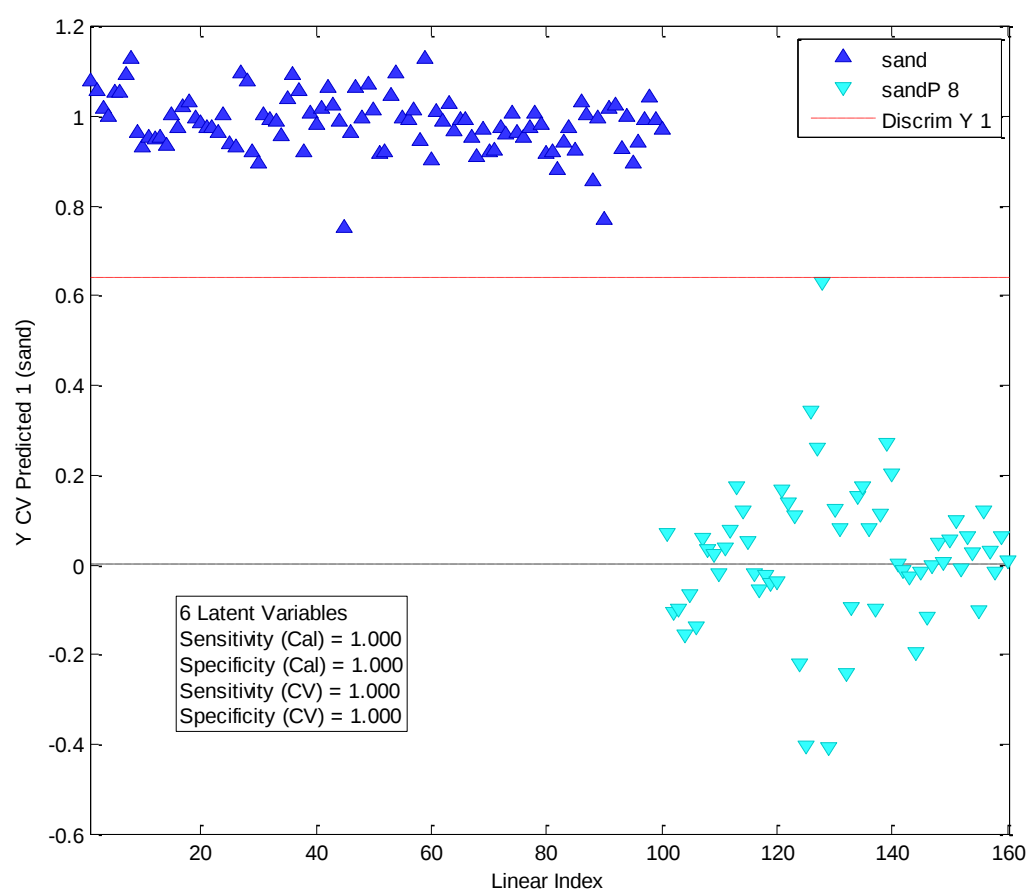


Figure S14. PLS-DA model of calibration for the discrimination of sand with 8% of petroleum and without petroleum traces, using the spectral region from 1000 to 1600 cm^{-1} .