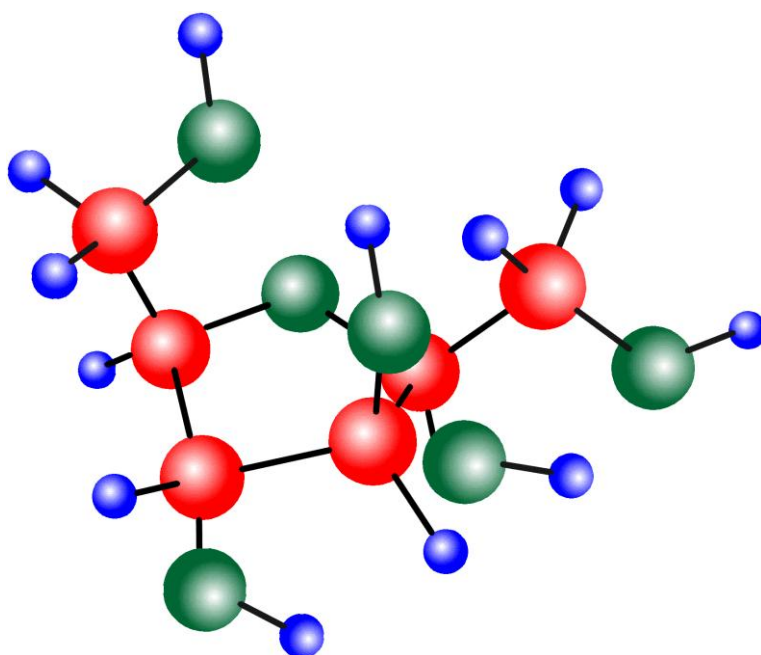


# MinSpectra



## MinServ

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# Installation

MinSpectra is supplied on a CD. To install MinSpectra on your PC follow these instructions:

System Requirements:

Windows 2000, XP, Vista, Windows 7, Server 2008

Internet Explorer 6 SP1

Devices supported by Windows

Printer supported by Windows.

For automatic installation, proceed as follows:

1. Start windows and place CD into CD drive
2. Select Run from the Start menu
3. Type [CDROM]D:Disk1/Setup.exe followed by <enter>

Installation will now proceed. During installation, the user is prompted for a directory. If this is ignored, a new directory called MinSpectra will be created. If a directory path is entered, a new directory with this name will be created. The user will be notified when installation is complete. A new Menu Item containing MinSpectra is created. Click on MinSpectra to start the program.

# About MinSpectra

Minspectra is a program to display and analyze mineral spectral data. Within the last ten years mineral spectral analysis via spaceborne, airborne and surface instruments has become widespread and is now the principle method for analysing and mapping minerals on a regional scale. Most existing databases are compiled from Thermal Emission Spectrometers (TES), which collect data in the infra-red (IR), near infra-red (NIR) and shortwave-infrared (SWIR) ranges. These wavelengths have proven to be the most effective for mineral identification.

MinSpectra will display digital spectral files and also extract peaks and perform further analyses. Bitmap images of spectral plots can also be displayed, as some databases use this type of data for displaying spectral plots. A database menu is available for linking to external spectral databases. MinSpectra can be used with the Arizona State University (ASU) rock forming minerals spectral database, supplied as a text file that can be loaded directly into MinSpectra's spreadsheet. USGS spectral library 4a and 5a are also supplied. Each mineral in USGS Spectra Library 4a consists of two files: 1: A heading file (\*.txt) containing file information and a data file (\*.spc) containing the spectral data. The spectra files can be loaded directly into MinSpectra. USGS Spectra Library 5a files (\*.asc) can be loaded directly into MinSpectra.

# How To Use MinSpectra

## **Getting Started**

Sample data files are provided for initial use with the program. To load a digital spectral file, select Open from the File Menu and Click on USGS 4a Spectra File in Filename Extension Box. Select one of the \*.spc files in the minspectra/USGS4a directory to plot or use your own file.

## **Entering Peak Data**

Select New from the File menu to start a new data file. Data is entered in each cell by simply typing the value and pressing <enter>. Use the scroll bars, arrow, page up and page down keys to navigate through the spreadsheet. Page up and page down keys will display the next screen in adjacent columns. To edit a cell, press <enter> for the cell you want to edit and use the backspace/delete/insert keys to edit the text. When finished editing press <enter> the new value will appear in the spreadsheet. Whole rows can be inserted and deleted using the Insert Row and Delete Row command buttons. Blank lines are not permitted between data. When you have finished using the program, select Exit from the File menu.

## **Plotting a File**

Select Plot Scan File from the Options Menu or Click on the Plot Scan File Toolbar Button. The Plot Scan File Options Window will display. Select Plot from Spreadsheet to plot a scan file already loaded into MinSpectra's spreadsheet. Alternatively, click on Browse to plot a scan file located on your hard drive. To plot the file, click on the Plot Button.

## **Extracting Peaks**



Use Extract Peaks to extract all peaks above a specified reflectance and use Refine Peaks Option to filter out adjacent shoulder peaks.

# Main Menu System

## File Menu

The File Menu provides many standard file management options.

### New Command

Deletes data in the current spreadsheet to begin a new file

### Close Command

Closes the file displayed in the current window

### Open Command

The following file formats can be opened directly into MinSpectra:

MinSpectra File \*.msp

Tab Delimited ASCII File \*.txt

USGS Spectra 4a Library File \*.spc

USGS Spectra 5a Library File \*.asc

JHU Spectra File \*.txt

Provides access to the Open common dialog box. Opens a new file. Select the directory and file and click OK. Files can also be opened by clicking the Open toolbar button.

MinSpectra Data Files Have the following Format:

Line 1: "MinSpectra File"

Line 2: Date

Line 3: Radiation

Line 4: Mineral Name

Line 5: Column Headings

See File Formats for more information.

### **Import Text File Command**

Imports a text file. Select the type of file to import:

Space Delimited

Comma Delimited

Tab Delimited

Semi Colon Delimited

Fixed Width

Specify the number of lines to skip at the beginning of the file to avoid importation of file headings into the spreadsheet.

### **Save Command**

Saves a file to disk. The default filename is the current filename. The same result is obtained by clicking the Save command button.

### **Save As Command**

Saves a file to disk in a directory and filename specified by the user. A Save As dialog box pops up for the user to enter filename and directory path information.

### **View Image File Command**

Images can be viewed by selecting Add Image from the File Menu in Image Viewer Window. Images can be copied and pasted from the clipboard. The Image Viewer uses Object Linking and Embedding (OLE). The default picture type is a Windows Paint Image (paint.picture). Select Add Image to add a frame. Select Add Object or Add From File to load an image. The image can also be edited within Image Viewer using the menu. Close Image Viewer Window to exit. The image is not saved.

### **Print Command**

Prints a data file. A Print dialog box pops up. Select Print to print the file.

### **Print Setup Command**

Specifies printer settings available to the user. A Print Setup dialog box pops up with several options to control the printer.

### **Exit Command**

Quits the application.

## **Edit Menu**

The Edit Menu provides access to several standard commands for editing the spreadsheet.

### **Copy Command**

Copies selected text in the spreadsheet to the clipboard without deleting. Highlight the text to be copied by dragging the mouse or holding down the shift key and clicking cells. Select Copy to copy the selected text to the clipboard. Use Paste to paste text from the clipboard to the spreadsheet. Use Cut to remove highlighted text from the spreadsheet to the clipboard.

### **Cut Command**

Copies selected text from the spreadsheet to the clipboard and clears the highlighted area in the spreadsheet. Highlight text to be cut by dragging the mouse or holding down the shift key and clicking cells. Select Cut from the edit menu to transfer selected text to the clipboard. Use Paste to retrieve cut text from the clipboard. Use Copy when you want to copy text to the clipboard without deleting the highlighted text.

### **Paste Command**

Retrieves text from the clipboard and pastes it into selected cells. Highlight cells that are to receive the incoming text by dragging the mouse or holding down the shift key and clicking cells. Select Paste from the Edit menu to transfer text from the clipboard to the spreadsheet.. Any text that already exists in the highlighted cells will be replaced. If the number of selected cells are fewer than will hold the clipboard text, the rightmost text from the clipboard will be truncated to fit the selected cells. If the number of cells selected exceed the length of the clipboard text, the remaining cells will be cleared. Use Copy and Cut to send text to the clipboard.

### **Insert Row Command**

Inserts an entire row into the spreadsheet.

### **Delete Row Command**

Deletes an entire row from the spreadsheet.

## Search Menu

The Search Menu allows the user to find and replace user specified text.

### **Find Command**

Finds a user specified search text in the spreadsheet. A pop up Find dialog box prompts the user for the search text. Enter the exact search text and click OK to proceed with the search.

### **Find Next Command**

Repeats a search using the previous specified search text.

### **Replace Command**

Finds a user specified search text and replaces it with a user specified replace text. A pop up dialog box prompts the user for search text (Find What) and replacement text (Replace With). The following options are available:

**Find-** find the first occurrence of specified text

**Replace-** replace the current text with the specified replace text

**Replace All** - replace all occurrences of the search text with the specified replace text.

## Database Menu

### **Open External Database**

Opens an external database specified by the user. Click on the Browse Button to select a database program on your pc.



## **Options Menu**

### **Plot Scan Command**

Opens the Plot Scan Options Window for plotting digital spectral files.

### **Set Radiation Command**

This command opens the radiation dialog to set the default radiation type used in the spectral analysis. The usual types are:

VIS – Visible

IR – Infrared

NIR – Near Infrared

SWIR – Short Wave Infrared

Select one of these from the menu and click on OK to return to the spreadsheet. The radiation type is automatically saved with minspectra type tab delimited files (\*.msp).

### **Format Command**

This command opens the format dialog to set numeric formatting of wavelength and reflectance. Enter the number of decimal places to round wavelength or reflectance. Select Save to save the formatting information without formatting the data or Format to format the data immediately.

### **Grid**

Sets the editing mode of the spreadsheet. Select move right to enter data by row or move down to enter data by column.

### **Reflectance to Percentage**

Converts intensity values that have been read from the spectrometer as counts to percentage. Enter the upper intensity limit of the data and click on calculate to convert.

### **Extract Peaks**

Extracts peak intensities and wavelength values above a specified reflectance from digital spectral files. Recommended to use the Plot Scan Window to extract peaks as this is much faster than importing a scan file into a spreadsheet and extracting peaks there.

Typically, extracting peaks is a two part process. Peaks are first extracted from the scan file using the Extract Peaks Option. This creates a new spreadsheet or table with extracted peaks. There will be many shoulder peaks from the initial scan file and it is necessary to Refine and Filter the Peaks to obtain a final peak file. Use the Refine Peaks Option to filter out shoulder peaks.

### **Refine Peaks**

This option removes adjacent shoulder peaks from the peak file. Specify a range for adjacent peaks and all adjacent peaks within this range will be deleted. Use the recommended values if you are unsure which values to use. Typically, extracting peaks is a two part process. Peaks are first extracted from the scan file using the Extract Peaks Option to extract peaks above a specified intensity value. This creates a new spreadsheet with extracted peaks. There will be many adjacent shoulder peaks from the initial scan file and it is necessary to Refine and Filter the Peaks to obtain a final peak file. Use the Refine Peaks Option to filter out adjacent shoulder peaks.

### **Insert Column Headings Command**

Select this option to insert standard column headings into the spreadsheet. Column headings will be placed in Row 1 and in the columns set with the Define Columns command. Wavelength and Reflectance headings are inserted.

### **Define Columns Command**

When a data file in a different format is imported , columns containing wavelength and reflectance must be defined using this command so that the calculations and plotting will be performed correctly. Enter a column number between 1 and 200 in the Define Columns dialog box that corresponds to the data type. If your data file contains additional data, it will still be displayed intact and all spreadsheet functions will work.

### **Restore Settings Command**

Select this option to restore the the recommended settings for all options.

# Plot Scan Options Window

The Plot Scan Options Window sets options to plot a digital scan file.

## **File Name to Plot**

Click on the Browse Button to select a scan file to plot. The following scan file types can be plotted:

MinSpectra File \*.msp

Tab Delimited ASCII File \*.txt

USGS Spectra File V4a \*.spc

USGS Spectra File V5a \*.asc

JHU Spectra File \*.txt

## **Plot From Spreadsheet**

Plots directly from the spreadsheet using the file loaded into the current spreadsheet. Specify the columns containing wavelength data and reflectance data. The default values are column 1 for wavelength and column 2 for reflectance.

## **Title**

Enter a Title for the Scan Plot here.

# Plot Scan Window

The Plot Scan Window displays the Scan File on screen with several options and controls. The Scan File can also be printed.

Axes Color

Axes Titles

Axes Labels

Box Draw

Copy Spectra

Delete All

Extract

Peaks

Fonts

Insert

Text

Labels

Line Draw

Print

Plot

Refine Peaks

Save Bitmap As

Undo

Spectra Color

Spectra Size

Spectra

Width

View

Image File

Zoom

### **Box Draw**

To draw a box, select box draw. The cursor will change to a cross hair. Position the cross hair where the box is to begin and drag the cursor by holding down the left mouse button. A dotted box is dragged with the mouse. Release the left mouse button when you have positioned the box correctly.

### **Line Draw**

To draw a line select Line Draw. The cursor will change to a cross hair. Position the cursor where you would like the line to begin and drag the line by holding down the left mouse button and moving the mouse. Release the left mouse button when the line is positioned correctly.

### **Fonts**

To change the font for inserted text select Fonts. A Font dialog box is displayed with a list of available fonts. Select a font in the list.

### **Zoom**

To magnify all or part of the plot click on the zoom toolbar button. Drag the mouse over the portion of the plot to be magnified. A new window will display the magnified image.

### **Insert Text**

To insert text select Insert Text. The cursor will change to an insertion icon. Position the cursor where you would like to insert text and click the left mouse button. Type the text to be inserted.

### **Save Bitmap As Command**

This command saves the current Spectra in a user specified directory and filename. A pop up dialog box appears which prompts the user for directory path and filename information. The user can select a graphics file format from a list in the dialog box.

### **Spectra Color**

Select this option to change the Spectra color. A color dialog box pops up for selecting the color of the Spectra. Select a color and click OK.

### **Axes Color**

Select this option to change the axes color. A color dialog box pops up for selecting the color of the axes and axes labels. Select a color and click OK.

### **Zoom**

Select this option to magnify details of peaks. Click on the Zoom toolbar button or select Zoom from the Edit Menu. The cursor changes to an up arrow. Drag the mouse over the peaks of interest. A new window displays a magnified image of the peaks. When finished click on the Zoom toolbar button or menu item to restore normal view. The accuracy of the d-spacing and two theta values on the status bar depend upon the scale resolution used by the program and may not match precisely with the spreadsheet values. By selecting a small area to zoom, for example a single peak, the accuracy is increased.

### **Axes Label**

Select this option to change the font for the axes labels. A font dialog box pops up. Select a font from the list. After a font is selected, click OK. The spectra is plotted with the new axes labels.

### **Axes Titles**

Select this option to change the font for the axes titles. A font dialog box pops up. Select a font from the list. After a font is selected, click OK. The spectra is plotted with the new axes titles.

### **Spectra Size**

Select normal or small to change the default size of the printed Spectra.

### **Copy Spectra Command**

Copies the current Spectra to the clipboard for pasting into other applications.

## **Grid**

Displays a list of data values that appear on the Spectra. Click on a set of data to highlight the corresponding peak on the plot. Labels can be plotted next to the highlighted line by Set Labels Command located in the Options menu.

## **Print Spectra**

Prints the current Spectra. A pop up Print dialog box appears. Click OK to accept the default settings and print the Spectra. Any labels will be printed with the Spectra. If peaks appear to be overlapping, select a smaller scale or use landscape orientation.

## **Print Peak File**

Prints a list of peaks that have been extracted in the Plot Scan Window

## **Overlays**

Imports additional scan files to plot as overlays on the original plot. Upto 4 overlays can be plotted over the original.

## **Extract Peaks**

Extracts peak intensities above a specified intensity from digital scan files. Recommended to use the Plot Scan Window to extract peaks as this is much faster than importing a scan file into a spreadsheet and extracting peaks there.

Typically, extracting peaks is a two part process. Peaks are first extracted from the scan file using the Extract Peaks Option. This creates a new spreadsheet or table with extracted peaks. There will be many shoulder peaks from the initial scan file and it is necessary to Refine and Filter the Peaks to obtain a final peak file. Use the Refine Peaks Option to filter out shoulder peaks.

## **Refine Peaks**

This option removes adjacent shoulder peaks from the peak file. Specify a range for adjacent peaks and all adjacent peaks within this range will be deleted.



Use the recommended values if you are unsure which values to use. Typically, extracting peaks is a two part process. Peaks are first extracted from the scan file using the Extract Peaks Option to extract peaks above a specified background value. This creates a new spreadsheet with extracted peaks. There will be many adjacent shoulder peaks from the initial scan file and it is necessary to Refine and Filter the Peaks to obtain a final peak file. Use the Refine Peaks Option to filter out adjacent shoulder peaks.

# File Formats

## File Formats

MinSpectra can import the following digital scan files:

MinSpectra \*.msp  
Tab Delimited ASCII Type .txt  
Text Files \*.txt, \*.dat  
USGS Spectra Library V4a \*.spc  
USGS Spectra Library V5a \*.asc  
John Hopkins University Spectral Library \*.txt

The built in spreadsheet reads and writes data files in tab delimited ASCII format. This format is used by Microsoft Excel and is compatible with most spreadsheets. To import a data file created with another application, save the file in tab delimited format (in Excel, these files have a .txt extension) , start MinSpectra and open the data file. MinSpectra will automatically load the file into the spreadsheet. To export a data file created with MinSpectra, use any of the following methods:

1. Select tab delimited ASCII format in the other application. These files usually have a .txt extension. Open the file.
2. In Excel, the file created with MinSpectra can simply be opened directly. The built in spreadsheet requires data to be in a specific format for plotting and converting. The first row in the spreadsheet is reserved for column headings. Any data placed in the first row will not be included in subsequent calculations. Imported data files will be displayed intact with all headings and data; however, to use MinSpectra's features it is necessary to correctly define which columns contain wavelength and reflectance with the Define Columns command.

Additional data can be entered via the keyboard or using the clipboard. Other text files can be imported using the Import Text Files Command in the File Menu. Several options are displayed. See Import Text Files for more information.

## **MinSpectra Files**

MinSpectra Data Files Have the Following Format:

Line 1: "MinSpectra File"

Line 2: Date

Line 3: Radiation

Line 4: Mineral Name

Line 5: Column Headings

Line 6 to End: Data

MinSpectra Files opened within MinSpectra load data and column headings only into the spreadsheet.

## **USGS Spectra Library 4a and 5a**

USGS spectral library 4a and 5a are also supplied. Spectra library 4a is supplied with each mineral consisting of two files: 1: A heading file (\*.txt) containing file information and 2: a data file (\*.spc) containing the spectral data. The data files can be loaded directly into MinSpectra.

The data files (\*.spc) have the following format:

Line 1: Headings

Line 2 to End: Data

The USGS spectra 4a data files contain inconsistent data. The inconsistent data have the following characteristics:

Very Large Numbers to Exponent 34. These rows should be deleted and the altered file saved. MinSpectra will automatically compensate for the inconsistent data if a USGS \*.spc file is plotted.

USGS spectra library 5a consists of 2000 spectra of natural and man made materials for remote sensing image interpretation. Spectra 5a library consists of ascii text files (\*.asc) that can be loaded directly into MinSpectra. Files can also be downloaded from the USGS Spectroscopy Website.

### **John Hopkins University (ASU) Spectral Library**

MinSpectra can be used with the John Hopkins University (JHU) spectral database, supplied as text files that can be loaded directly into MinSpectra's spreadsheet.

The JHU Spectra Library File is in the Following Format:

Line 1 to Line 26: File headings containing descriptions and identification information

Line 27 to End: Data

The John Hopkins University Spectral Library contains data for minerals, water and ice, vegetation, soils, lunar, meteorites and man made materials.

With the exception of manmade materials, all spectra in the Johns Hopkins Library were measured under the direction of John W. (Jack) Salisbury. Most measurements were made by Dana M. D'Aria, either at Johns Hopkins University in Ballimore, MD, or at the U.S. Geological Survey in Retsina, VA.

### **Arizona State University (ASU) Spectral Library for Rock Forming Minerals**

MinSpectra can be used with the Arizona State University (ASU) rock forming minerals spectral database, supplied as a text file (asuminerals.txt) that can be loaded directly into MinSpectra's spreadsheet.

The ASU Rock Forming Minerals Spectra Library File is in the Following Format:

Line 1: Column Headings, Column 1: Wavelength Data, Column2 to End: Mineral Names

Line 2 to End: Data

Plots created with MinSpectra can be saved as graphics files for exporting into paint programs, word processors and other applications. Graphs can be saved in the following formats:

### **1. bitmap (\*.bmp)**

Select [Save Spectra As](#) from the plot menu and enter the filename with the appropriate graphics extension.

## Spectral Libraries

There are several Mineral Spectra Libraries on the internet for use with mineral spectral analysis programs. The USGS publishes Mineral Spectral Library 4a and 5a. Jet Propulsion Laboratory publishes the Aster Spectral Library containing over 2000 minerals. Arizona State University publishes a Rock Forming Minerals Spectral Library. See the References section for detailed references. The spectral libraries are generally supplied in text files but may require further formatting to be compatible with spectral analysis programs. Several commercial companies manufacture Infra-Red Spectrometers and generally supply software and databases with their instruments. Integrated Spectronics manufacture the PIMA field spectrometer. Spectro Analytical also manufacture a portable spectrometer.

Arizona State University Spectral Library, <http://tes.asu.edu/speclib/>

Christensen, P. R., J. L. Bandfield, V. E. Hamilton, D. A. Howard, M. D. Lane, J. L. Piatek, S. W. Ruff, and W. L. Stefanov, A thermal emission spectral library of rock-forming minerals, *J. Geophys. Res.*, 105, 9735-9739, 2000.

JPL Spectral Library, <http://speclib.jpl.nasa.gov/>

Integrated Spectronics, Pima Field Spectrometer and Spectral Library, <http://www.intspec.com/>

R. N. Clark, G. A. Swayze, R. Wise, K. E. Livo, T. M. Hoefen, R. F. Kokaly, and S. J. Sutley, 2003, USGS Digital Spectral Library splib05a, *U.S. Geological Survey, Open File Report 03-395*

Spectro Analytical, <http://www.spectro-ai.com/>

# References

Arizona State University Spectral Library, <http://tes.asu.edu/speclib/>

Christensen, P. R., J. L. Bandfield, V. E. Hamilton, D. A. Howard, M. D. Lane, J. L. Piatek, S. W. Ruff, and W. L. Stefanov, A thermal emission spectral library of rock-forming minerals, *J. Geophys. Res.*, 105, 9735-9739, 2000.

CSIRO Mineral Mapping Technical Papers,  
<http://www.syd.dem.csiro.au/research/MMTG/Publications/Publications.htm>

JPL Spectral Library, <http://speclib.jpl.nasa.gov/>

Integrated Spectronics, Pima Field Spectrometer and Spectral Library,  
<http://www.intspec.com/>

R. N. Clark, G. A. Swayze, R. Wise, K. E. Livo, T. M. Hoefen, R. F. Kokaly, and S. J. Sutley, 2003, USGS Digital Spectral Library splib05a, *U.S. Geological Survey, Open File Report 03-395*

Salisbury, J. W., Walter, L. S., Vergo, N., and D'Aria, D. M., 1991b, Infrared (2.1-25 micrometers) Spectra of Minerals: Johns Hopkins University Press, 294 pp

Salisbury, J.W. (Dir), D'Aria, D.M., Johns Hopkins Library Spectral Library.

USGS Spectral Library, <http://speclab.cr.usgs.gov/spectral-lib.html>