2015-11-05

Choose Directory and Output file (\*.csv).

Input File type: Solartron \*.z, Fuchs \*.res, LabView \*.lvm

Read in directory of all data files.

Data File handler, to allow selection random, next or previous file, and display of file name.

Read in data file. Create float array: Freq, Magn, Angle, Real, Imag

Calculate Cole-plot scales such that all data fits on y=x spacing.

Display and choose maximum and minimum frequencies to use from the data file.

PLOTS: Plot data and fit. Also plot the component interpreted to originate from the rock alone rather than the apparatus. Plot the frequencies corresponding to the Zarc fits.

Cole-Cole Plot: [Real, -Imag]

Bode Plots: [Log(Freq), Log(Magnitude)] and [Log(Freq), Log(Abs(Phase))]

[Log(Freq), dLog(Magnitude)/dLog(Freq)]. This plot has features similar to the Bode Phase plot.

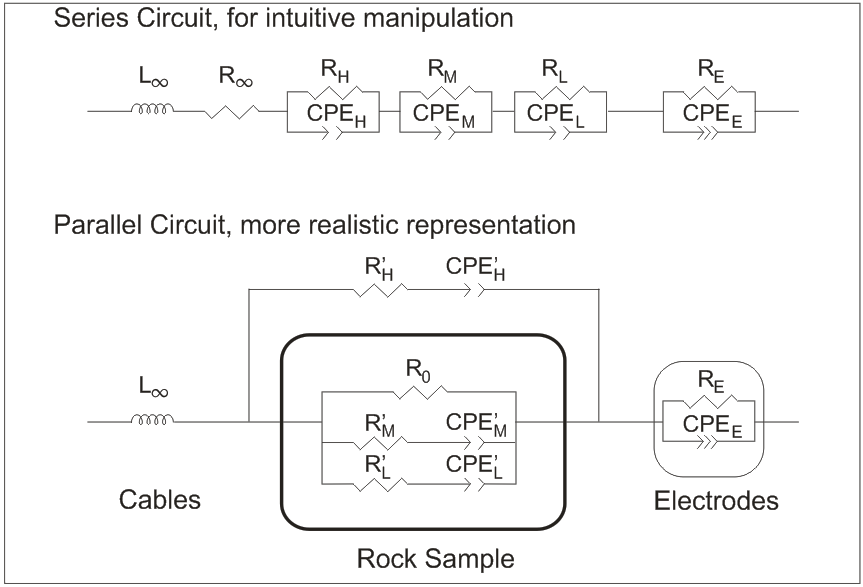
[Log(Freq), Log(Real)] and [Log(Freq), Log(Abs(Imag))]

Plot linear frequency (f = ω/2π) and phase in degrees, for easier intuitive understanding. Since the Cole-Cole plot has high frequency on the left (i.e., low real impedance) and low frequency on the right (high real impedance), reverse the frequency scale to follow the same pattern.

Time Domain: [time, voltage(step up) and voltage(step down)] Shade in Newmont integral, 430 to 1100 ms.

SPECTRAL IMPEDANCE FITTING

Parameters are selected using the series equivalent circuit model, but the calculations are made with either the series or parallel model, set by a switch.



Fit Parameters.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Explanation | Initial Fit Parameters | Initial Fit Value | Initial free / constrained |
| Rinf | Log(infinite frequency resistance) | 4 | 1E4 | free |
| Rh | Log(high frequency Zarc resistance), | 5 | 1E5 | free |
| Fh | Log(high frequency Zarc resonant frequency) | 5 | 1E5 | free |
| Ph | 10\*(high frequency Zarc exponent) | 8 | 0.8 | free |
| Rm | Log(medium frequency Zarc resistance) | 0 | 1 | constrained |
| Fm | Log(medium frequency Zarc resonant frequency) | -1 | 0.1 | constrained |
| Pm | 10\*( medium frequency Zarc exponent) | 5 | 0.5 | constrained |
| Rl | Log(low frequency Zarc resistance) | 4 | 1E4 | free |
| Fl | Log(low frequency Zarc resonant frequency) | 1 | 10 | free |
| Pl | 10\*(low frequency Zarc exponent) | 5 | 0.5 | free |
| Re | Log(high frequency Zarc resistance) | 10 | 1E10 | constrained |
| Qe | Log(high frequency Zarc resonant frequency) | -4 | 1E-4 | free |
| Pe-f | 10\*(high frequency Zarc exponent for frequency) | 5 | 0.5 | free |
| Pe-i | 10\*(high frequency Zarc exponent for phase) | 5 | 0.5 | free |
| Linf | Log(high frequency inductance) | -4 | 1E-4 | free |

For scaling, use the Log10 of exponentially varying parameters, and 10\* the parameter for variables that must lie between 0 and 1. Flag “constrained” variables by multiplying value by 1E6. A separate constraint variable vector holds values 1 for “free” and 1E6 for “constrained”.

A “real offset” variable is set, usually at zero, for cases when the high frequency impedance has unanalysable negative resistances.

Derived variables (' for the parallel equivalent circuit):

R'0 = R∞+RH +RM +RL

ωH=2πFH

QH=1/(RH ωHPh);

CH=1/(RH ωH);

R'H = R∞( R∞+ RH ) / RH

Q'H = QH ( RH / (R∞+ RH ) )2

C'H = CH ( RH / (R∞+ RH ) )2

ωM=2πFM

QM=1/(RM ωMPm);

CM=1/(RM ωM);

R'M = ( R∞+ RH ) ( R∞+ RH + RM) / RM

Q'M = QM ( RM / (R∞+ RH + RM) )2

C'M = CM ( RM / (R∞+ RH + RM) )2

ωL=2πFL

QL=1/(RL ωLPl);

CL=1/(RL ωL);

R'L = (R∞+RH+RM)(R∞+RH+RM +RL) / RL

Q'L = QM ( RL / (R∞+ RH + RM+ RL) )2

C'L = CM ( RL / (R∞+ RH + RM+ RL) )2

These are saved in a vector: [Rinf, Ro, Rh, Qh, Ch, Ph, Fh, pRh, pQh, pCh, Rm, Qm, Cm, Pm, Fm, pRm, pQm, pCm, Rl, Ql, Cl, Pl, Fl, pRl, pQl, pCl, Re, Qe, Pe-f, Pe-i, Linf]