

Graphical Comparison of Mineral Gibbs Free Energy Data

supplementary material for A&A paper entitled

“Equilibrium chemistry down to 100 K – Impact of silicates and phyllosilicates on carbon/oxygen ratio”

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North Haugh, KY16 9SS, St Andrews, UK;

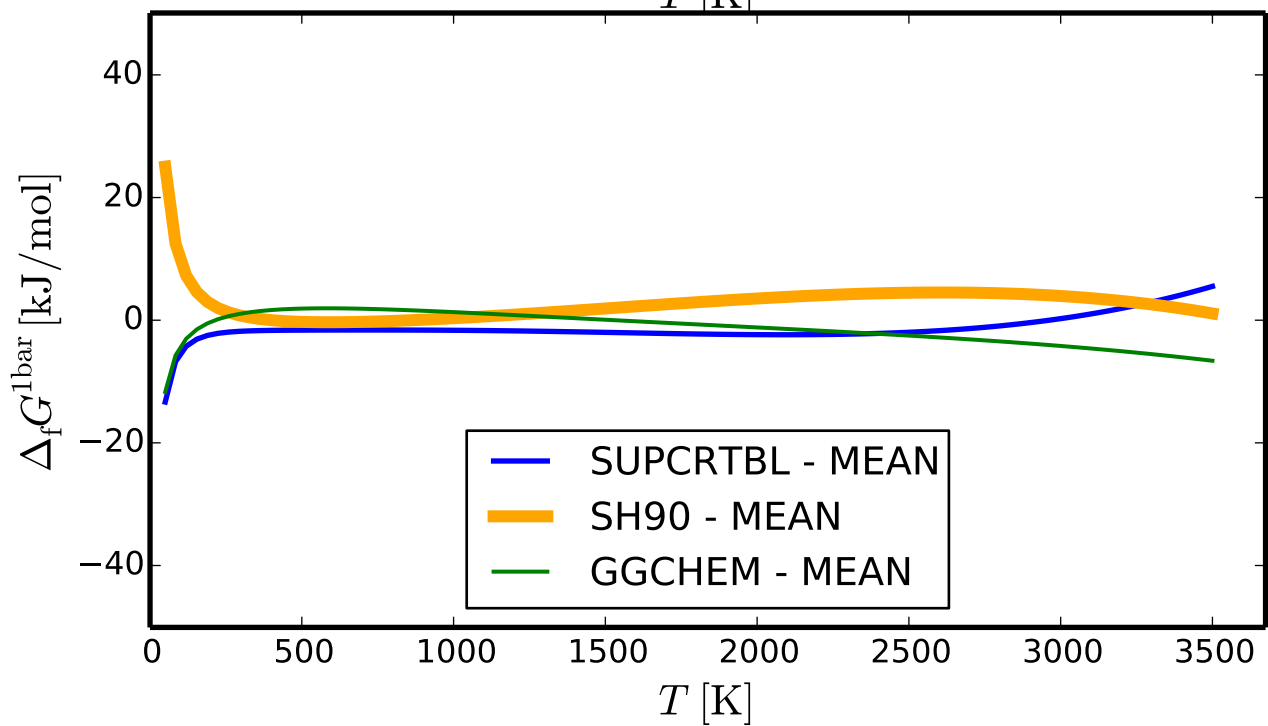
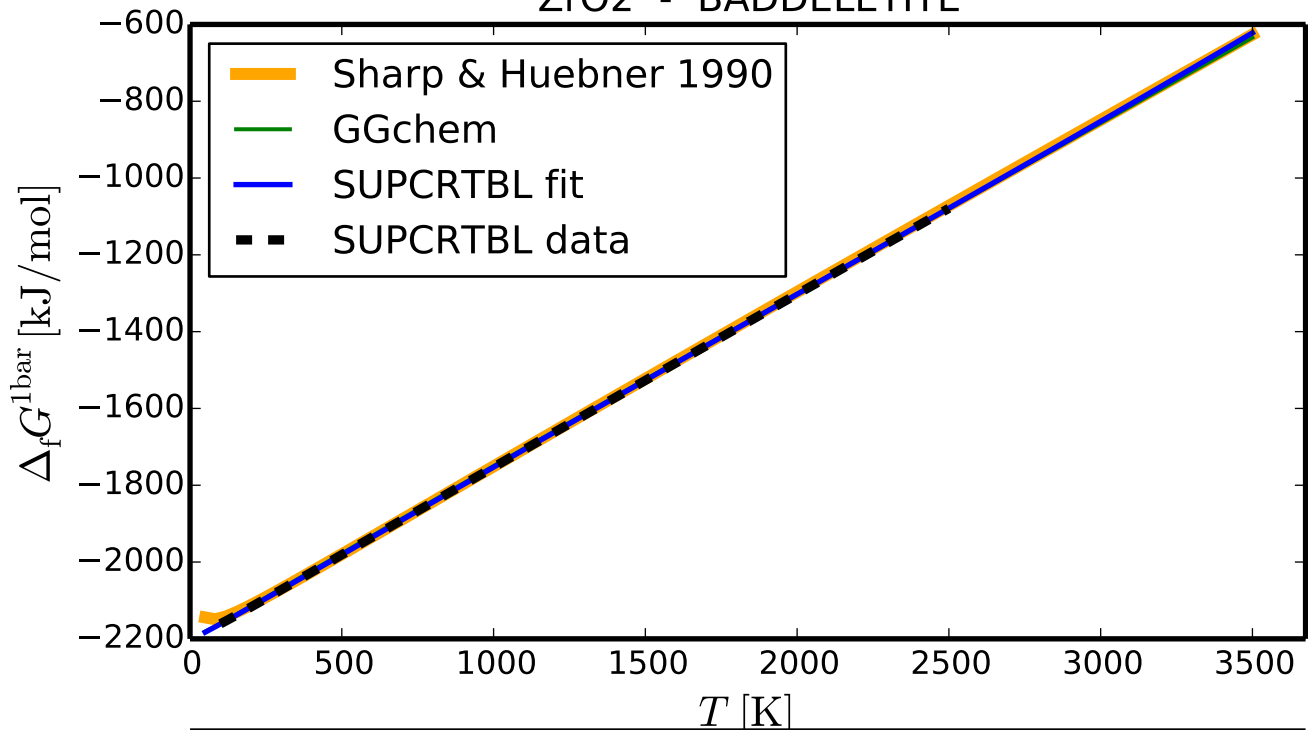
Centre for Exoplanet Science, University of St Andrews, UK

October 11, 2017

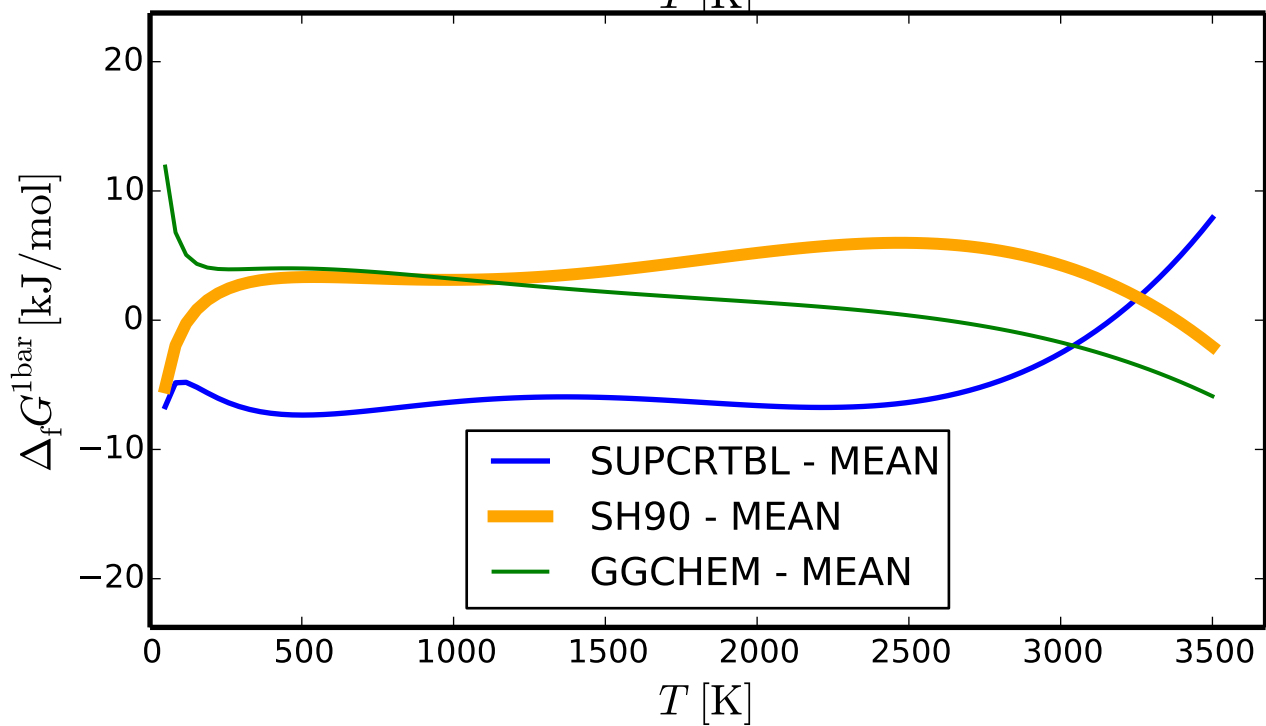
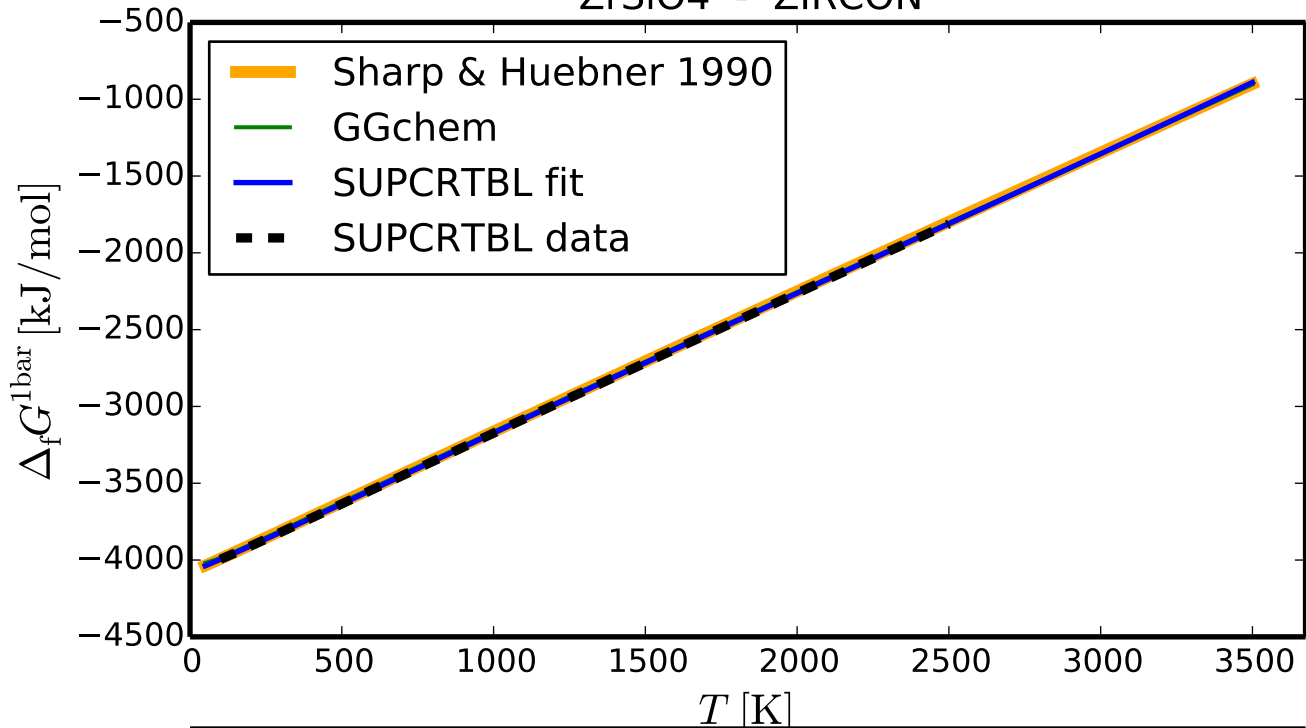
The following pages show plots of the Gibbs-free energy of formation ΔG_f° [kJ/mol] from free atoms as function of temperature T [K] of 121 solid minerals from the SUPCRTBL database (Zimmer et al., 2016). These thermo-chemical data are compared to other data sources in a second plot if available. The other data sources include (Sharp & Huebner, 1990, indicated by SH90) and fits done by the authors to the NIST-Janaf data (Chase, 1986, indicated by GGchem). The comparison plot shows differences to the mean data as indicated. The SUPCRTBL data points have been generated for temperatures 100 K to 2500 K according to the equations and parameters given in Zimmer et al.

References

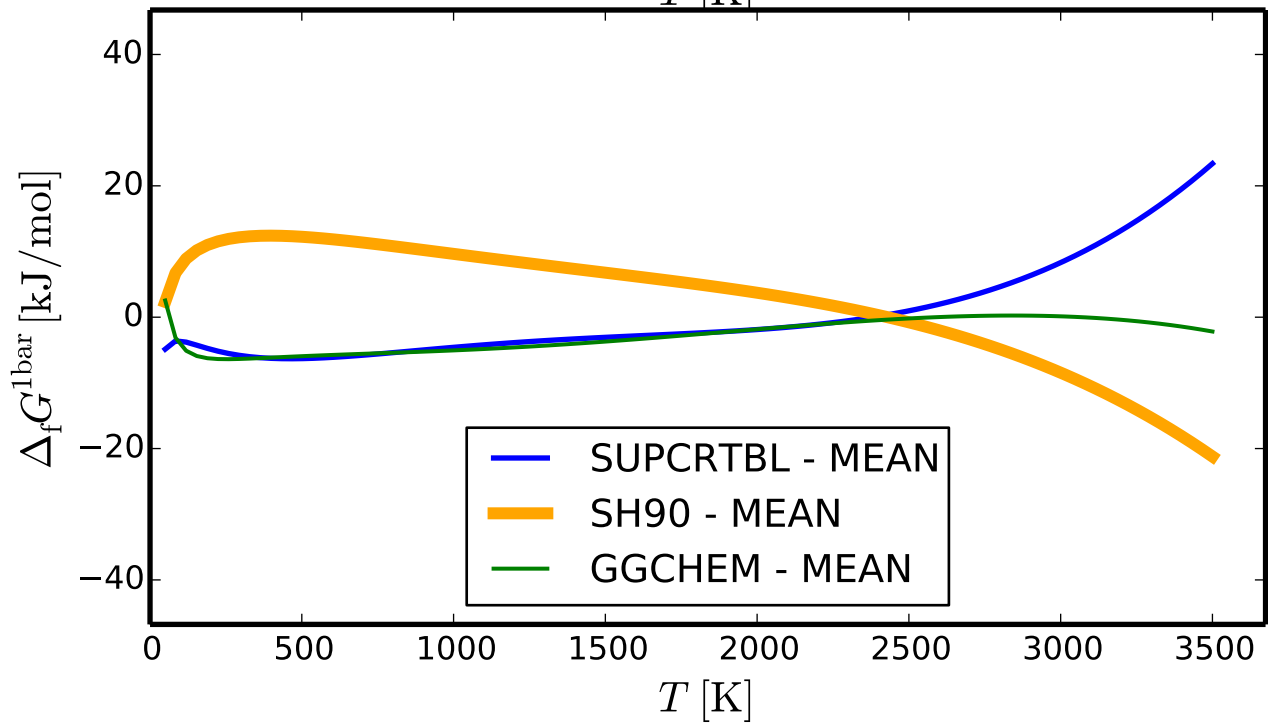
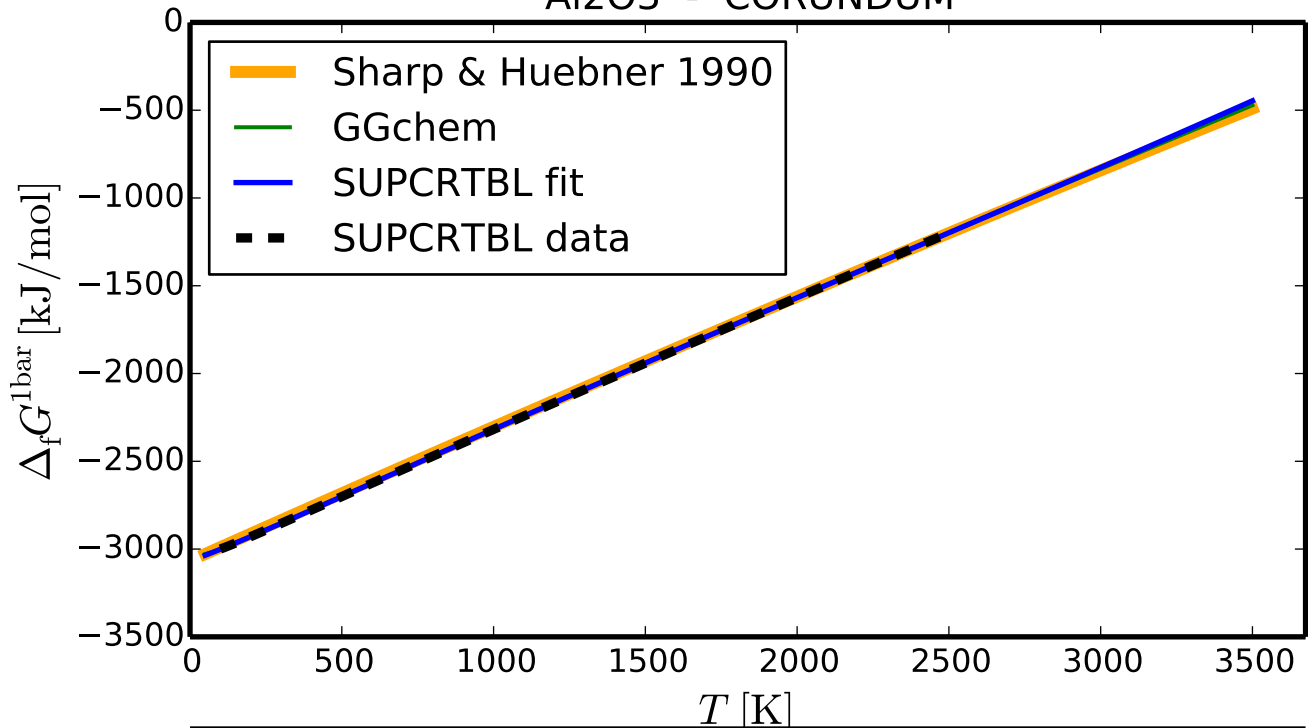
- Chase, M. W. 1986, JANAF thermochemical tables (American Chemical Society; New York)
- Sharp, C. M. & Huebner, W. F. 1990, ApJS, 72, 417
- Zimmer, K., Zhang, Y., Lu, P., et al. 2016, Computers and Geosciences, 90, 97

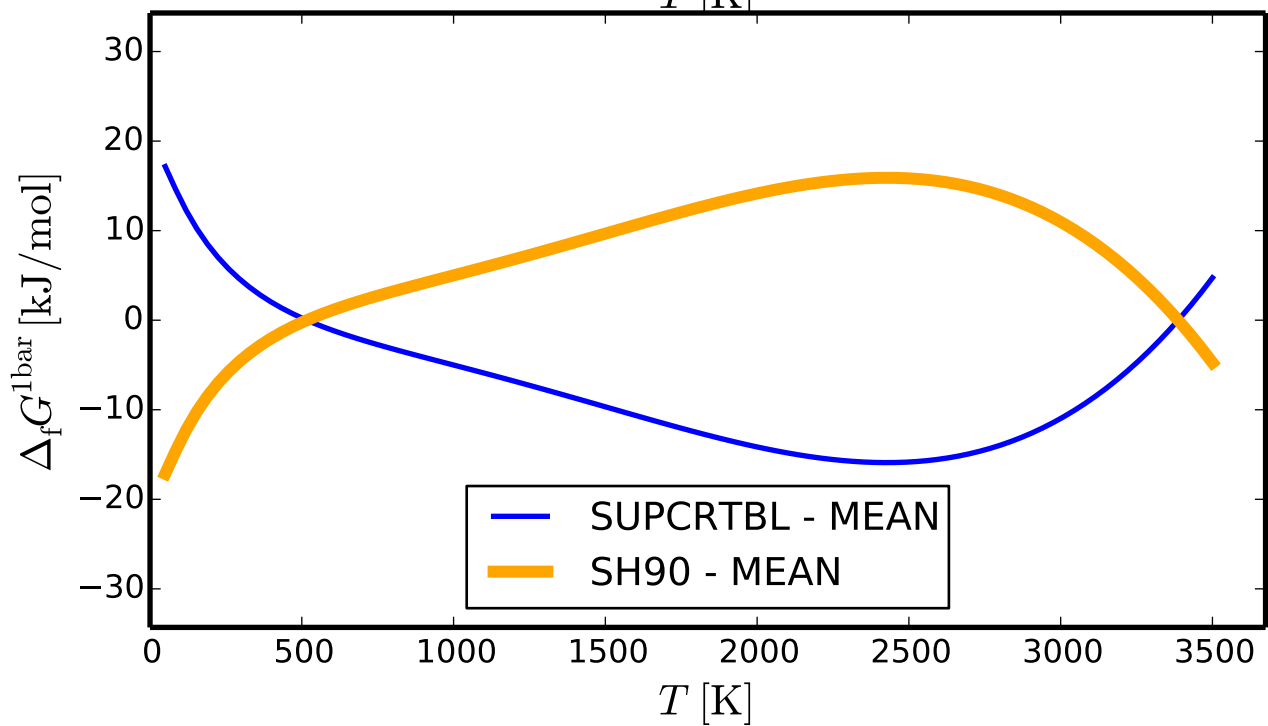
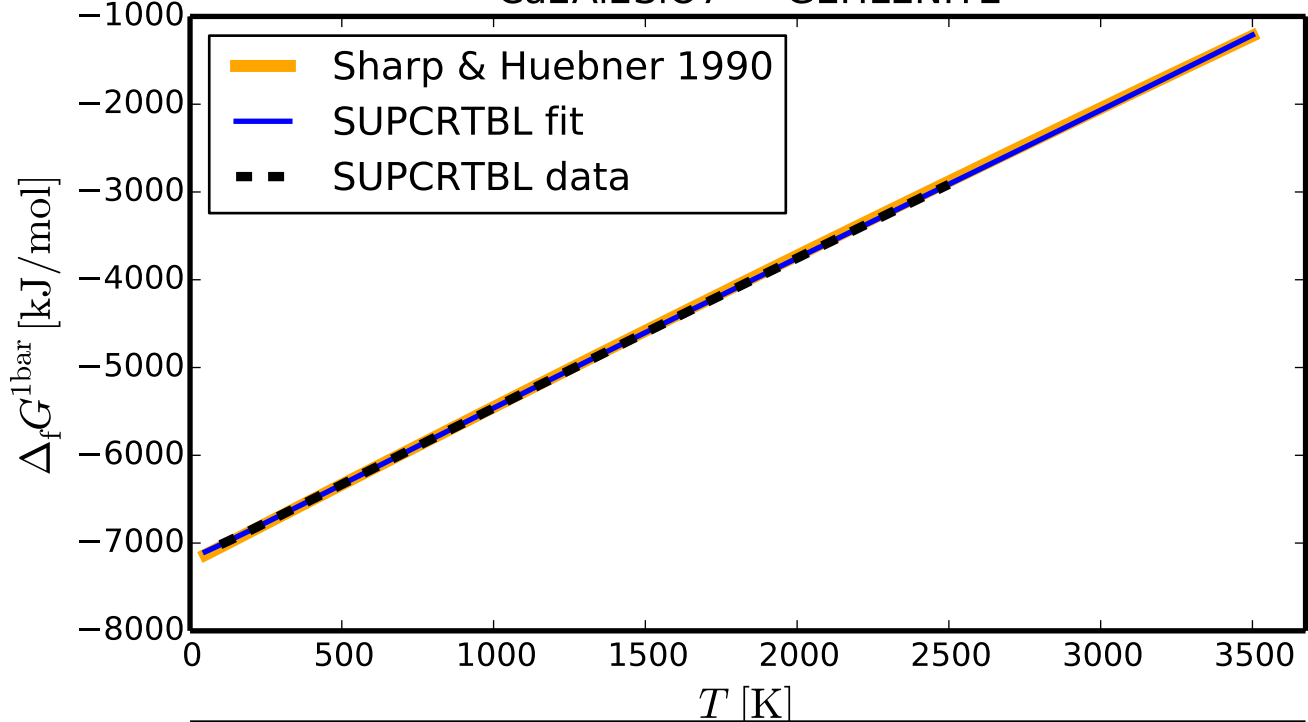
ZrO₂ - BADDELEYITE

ZrSiO4 - ZIRCON

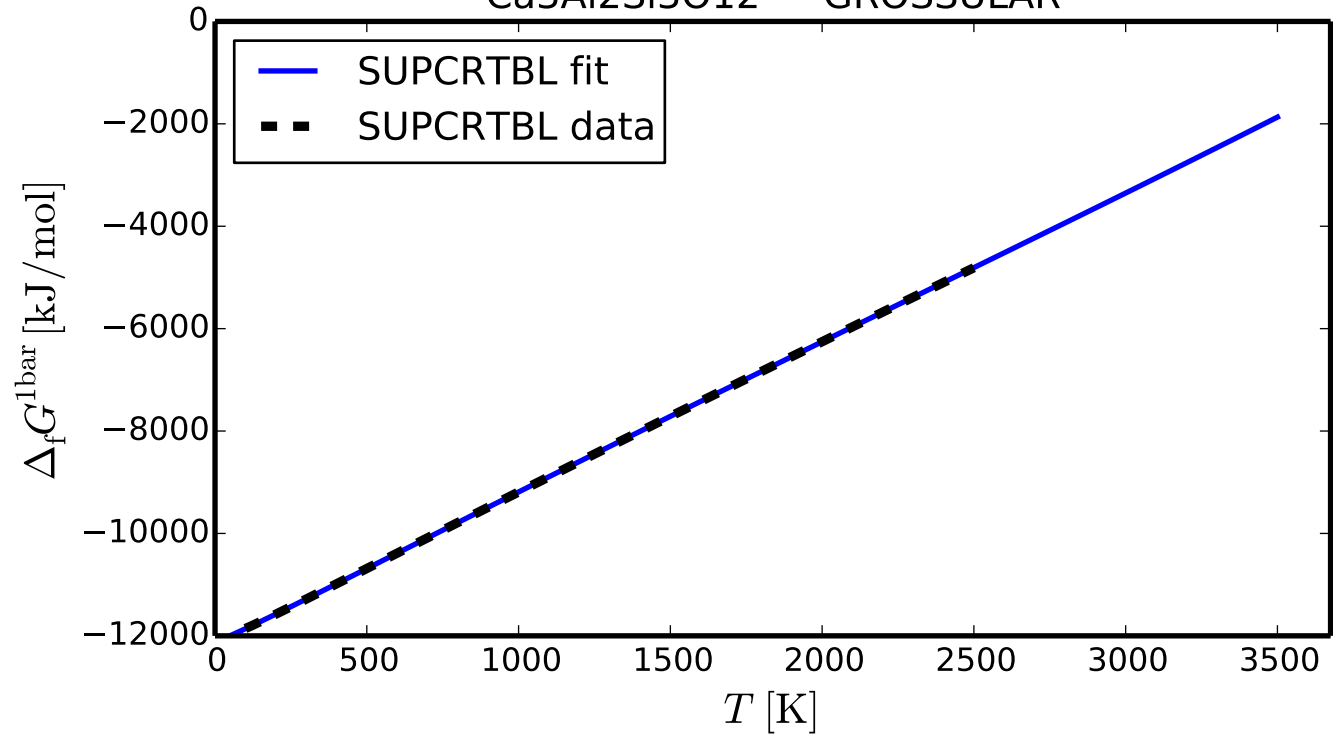


Al₂O₃ - CORUNDUM

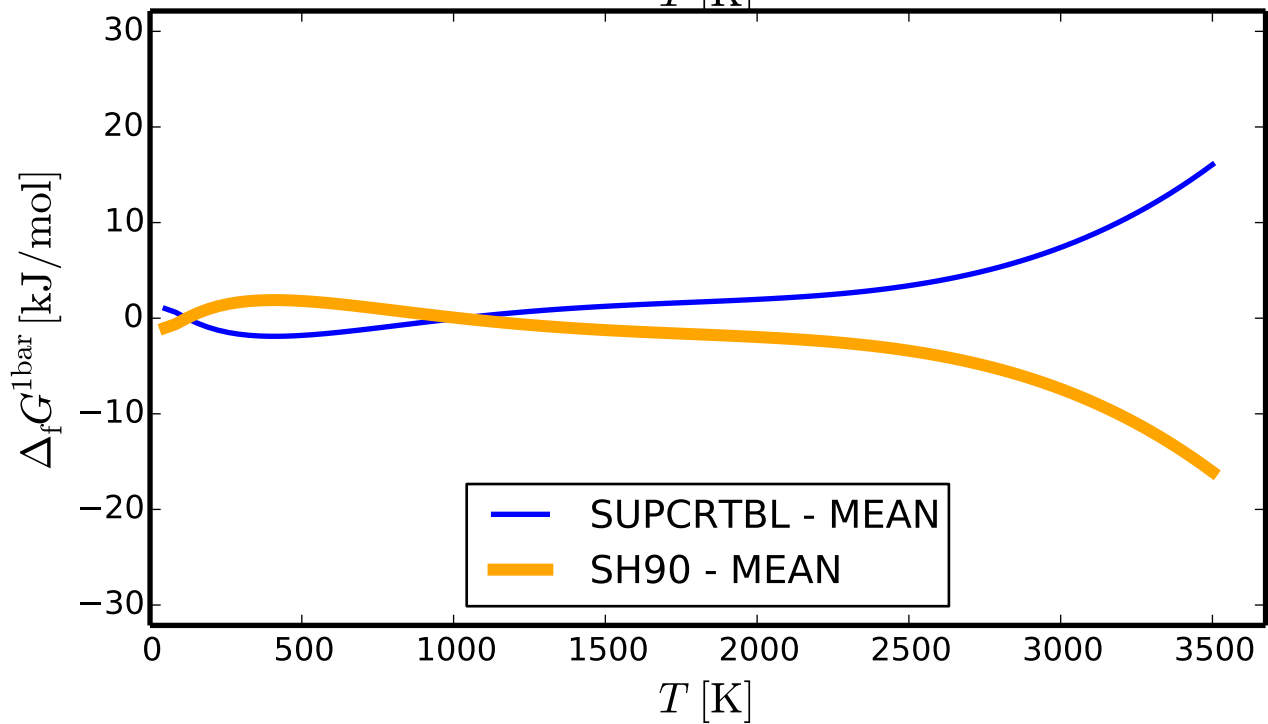
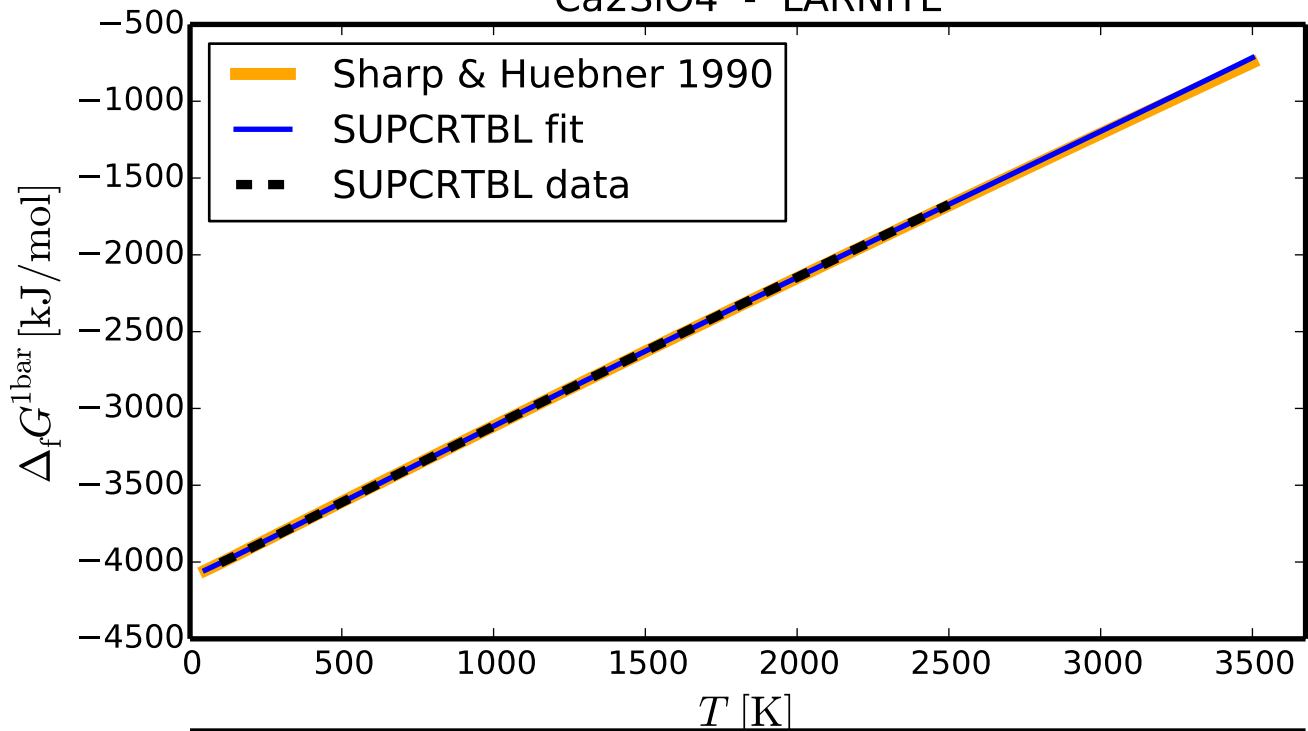


Ca₂Al₂SiO₇ - GEHLENITE

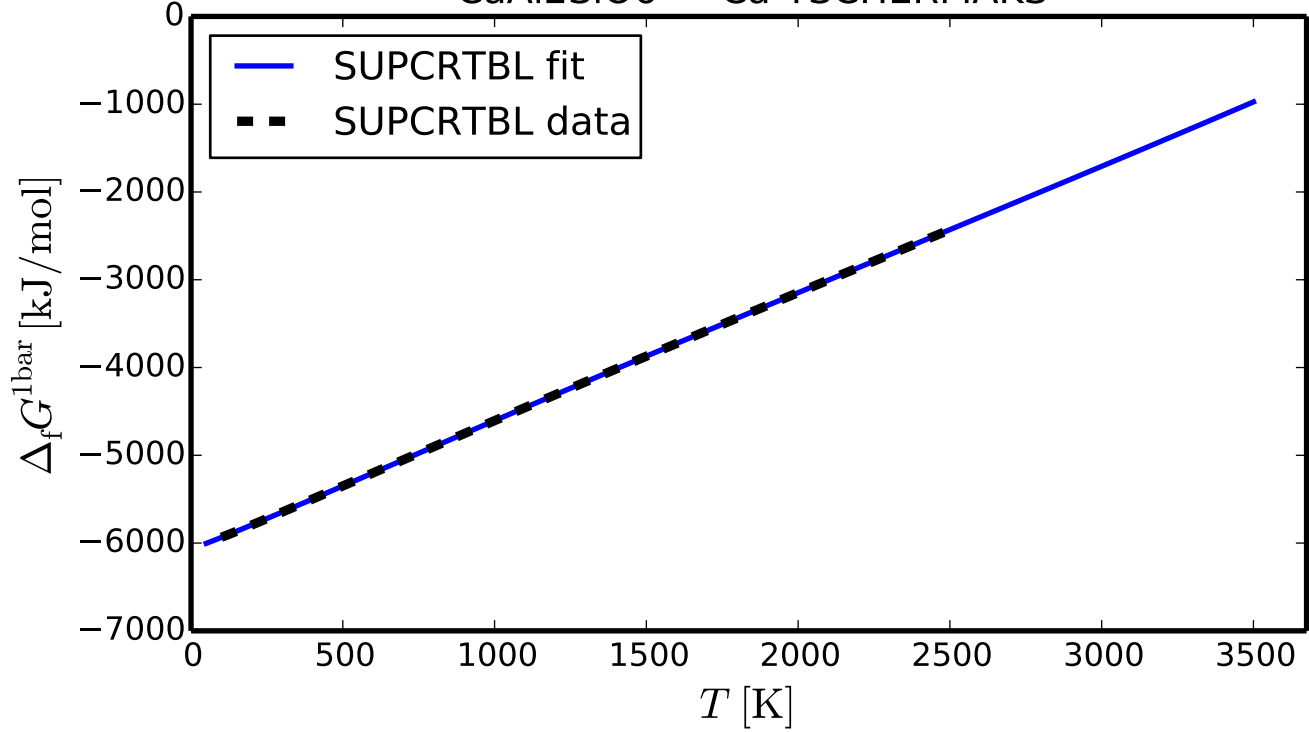
Ca₃Al₂Si₃O₁₂ - GROSSULAR



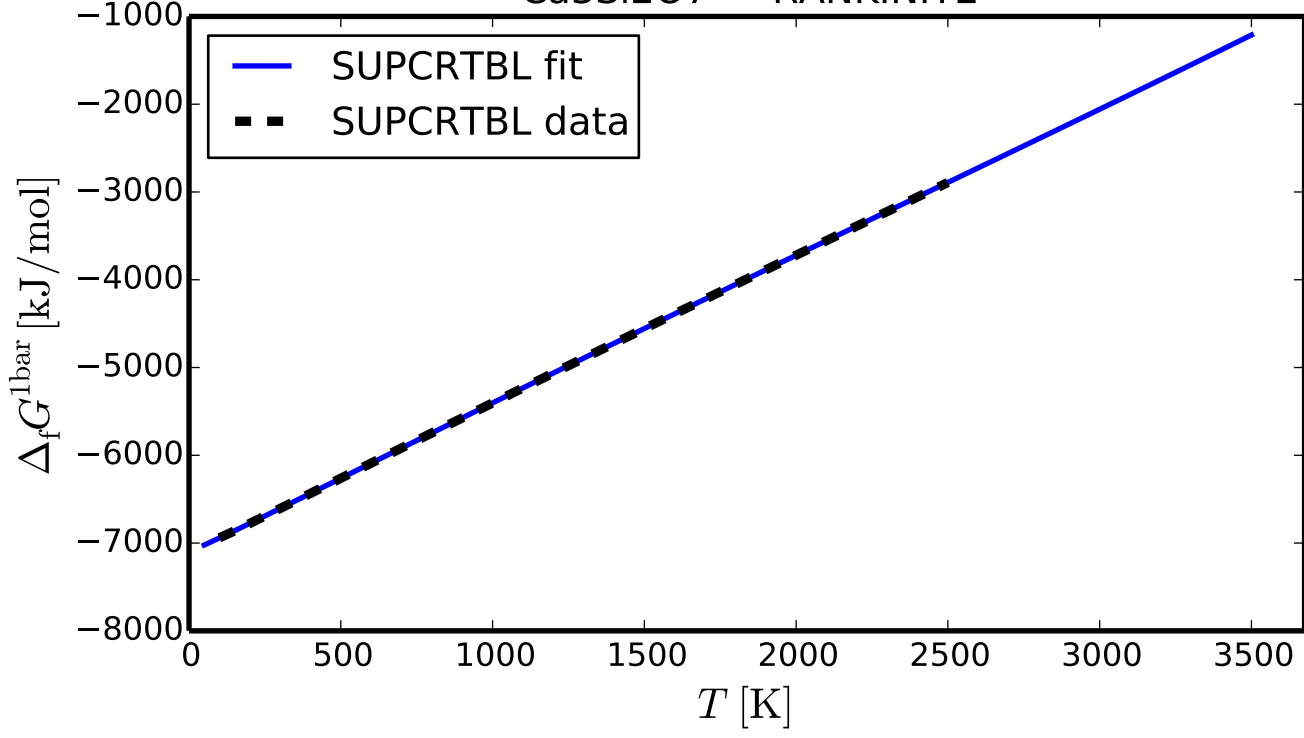
Ca2SiO4 - LARNITE



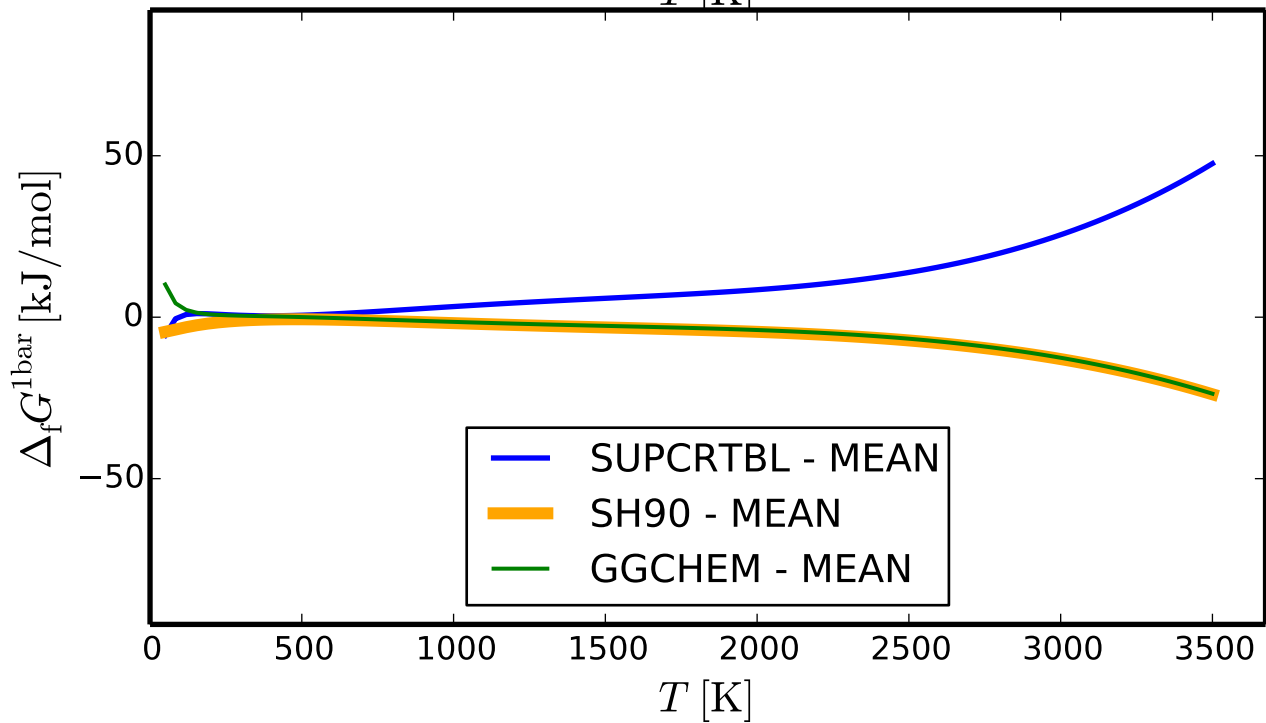
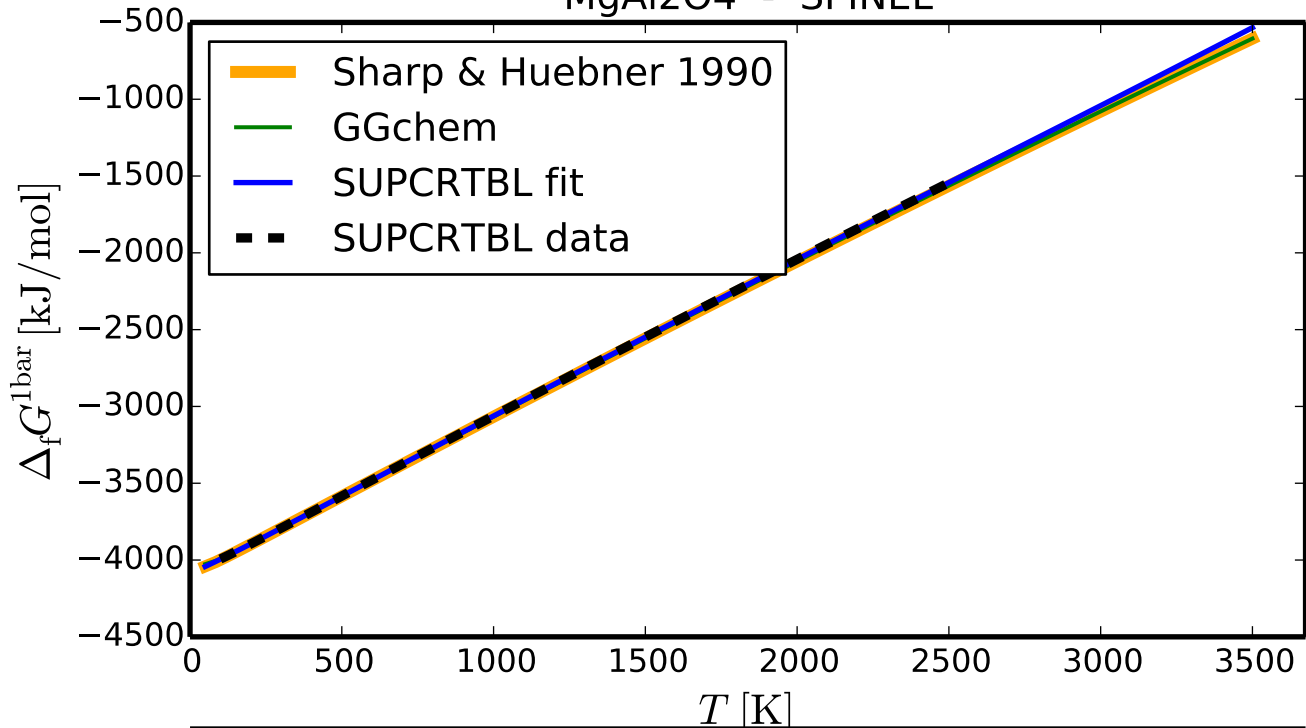
CaAl2SiO6 - Ca-TSCHERMAKS



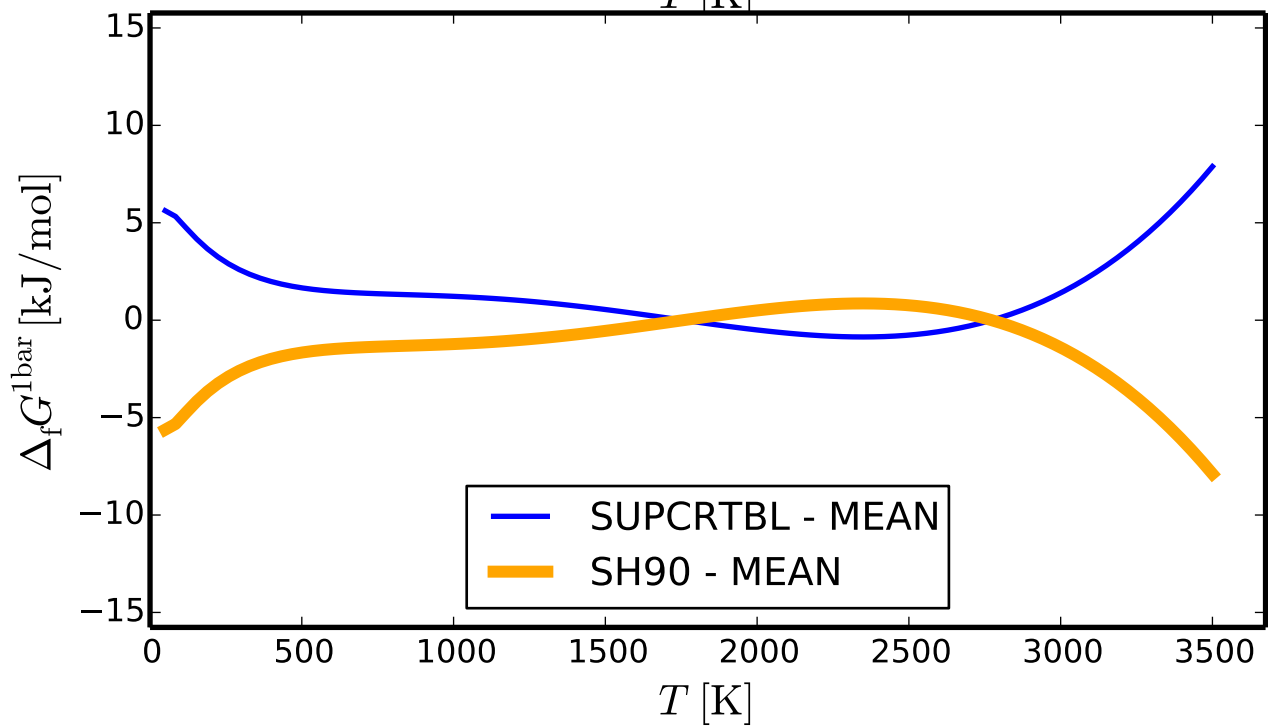
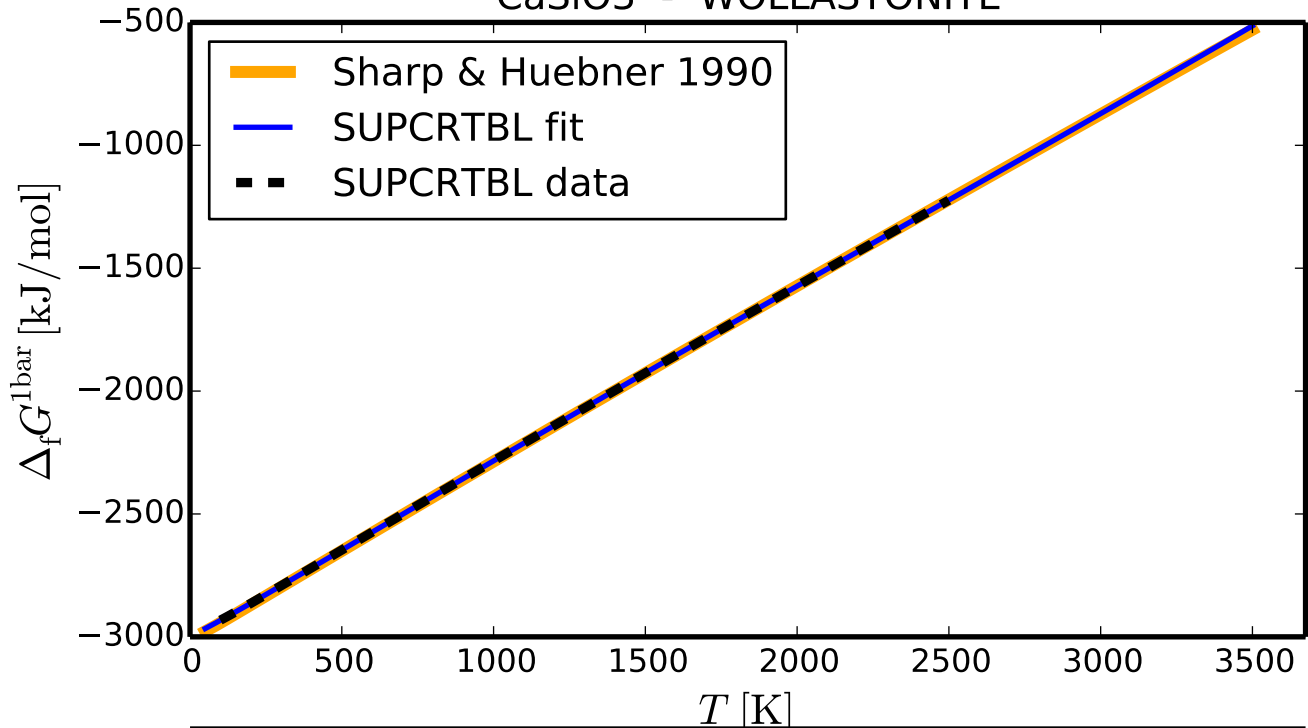
Ca3Si2O7 - RANKINITE



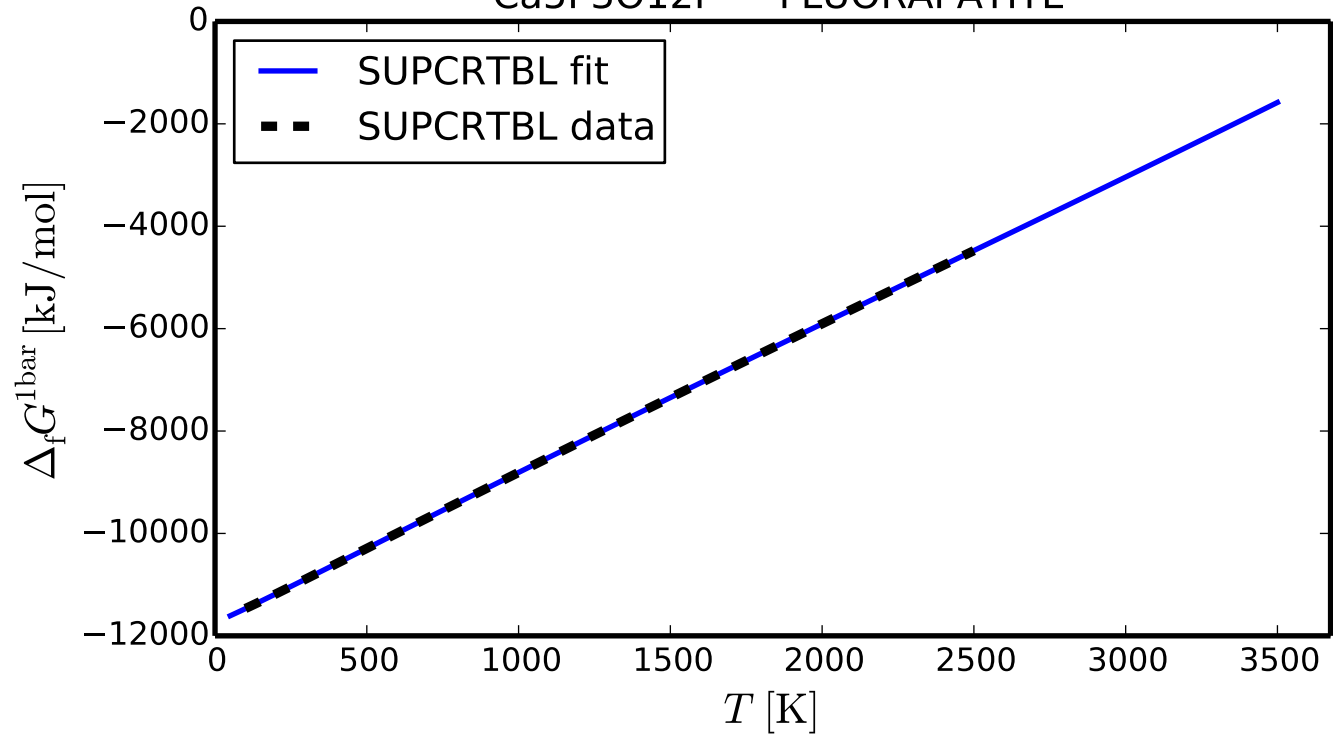
MgAl2O4 - SPINEL



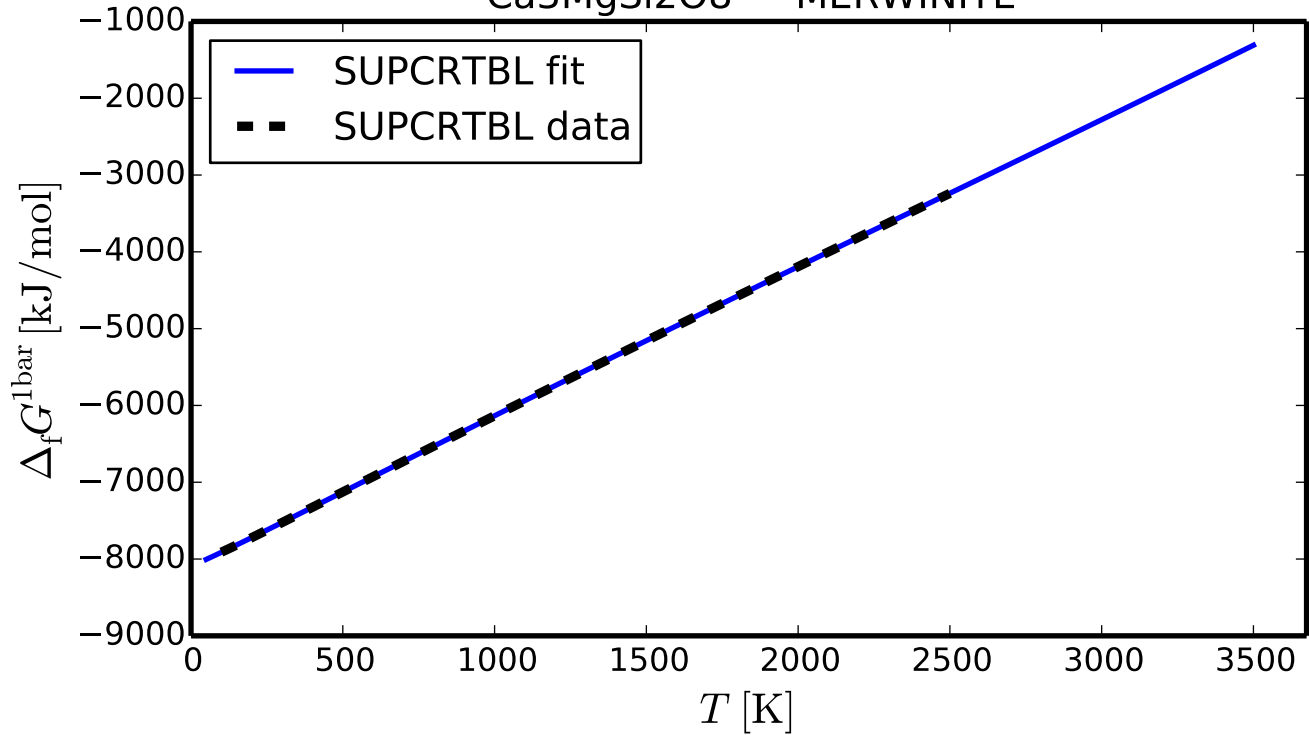
CaSiO3 - WOLLASTONITE

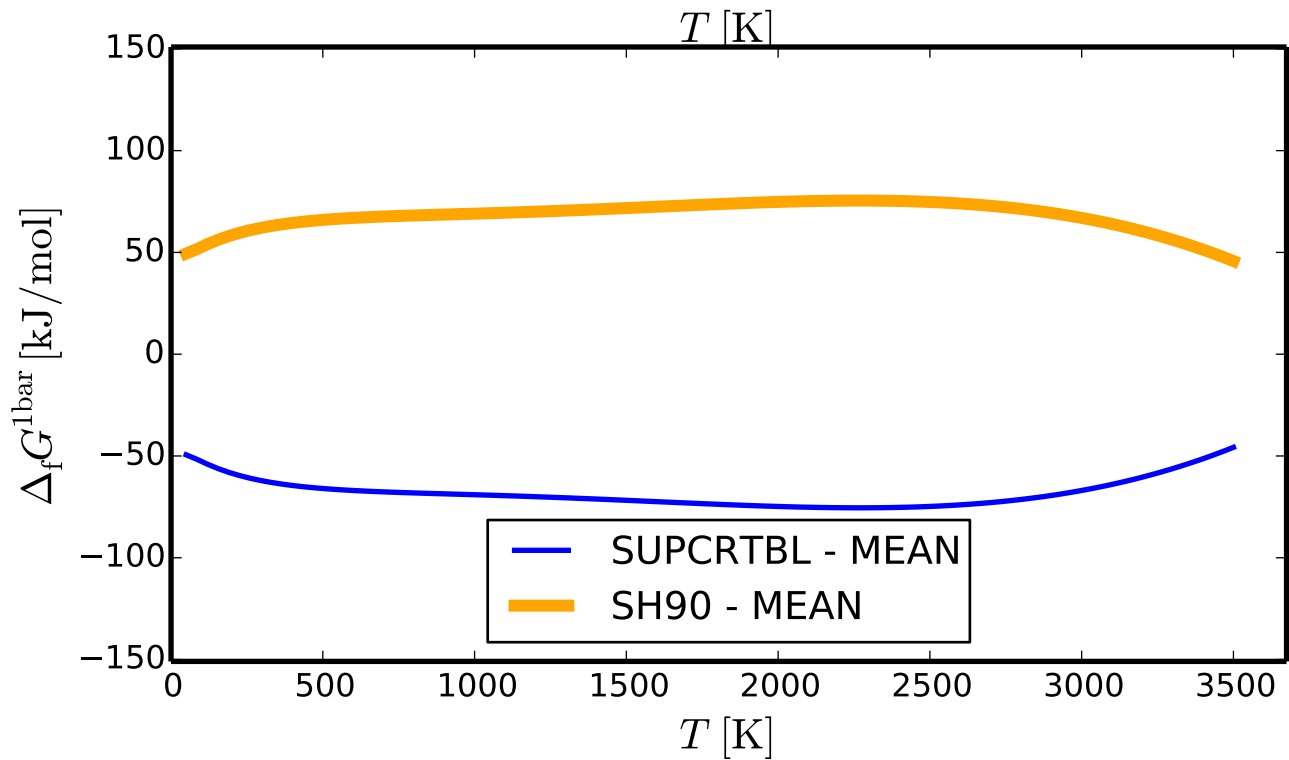
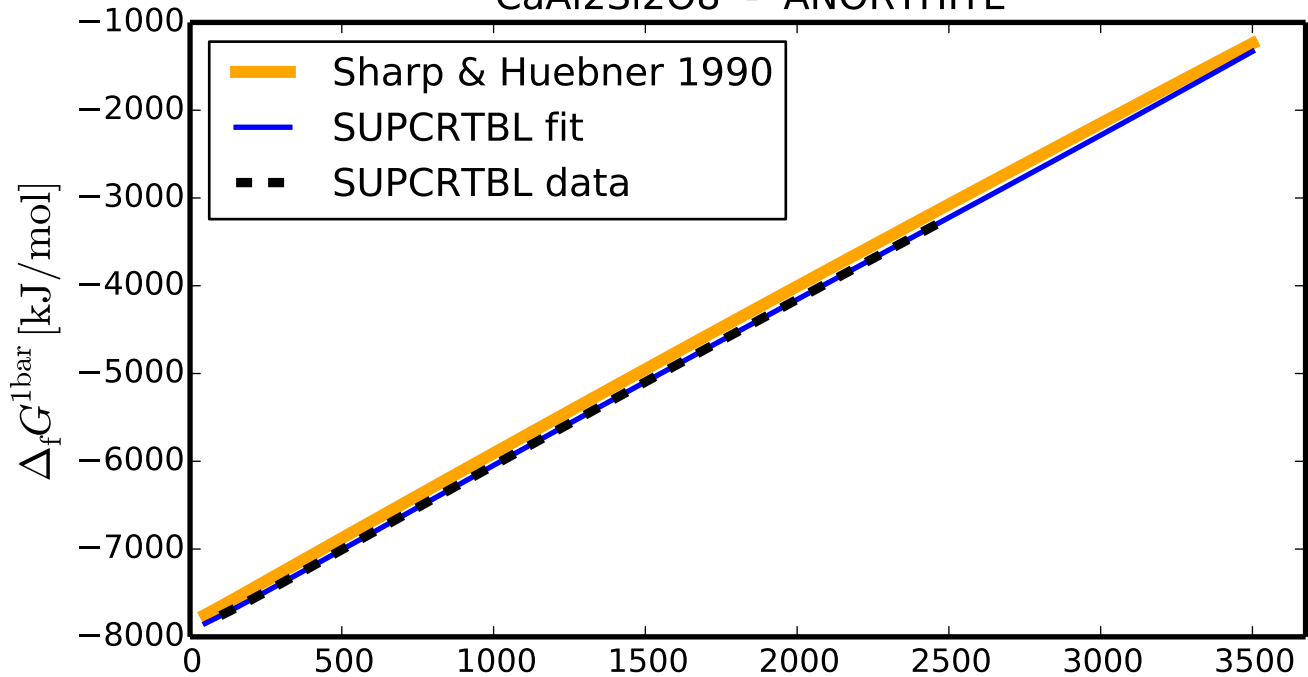


Ca5P3O12F - FLUORAPATITE

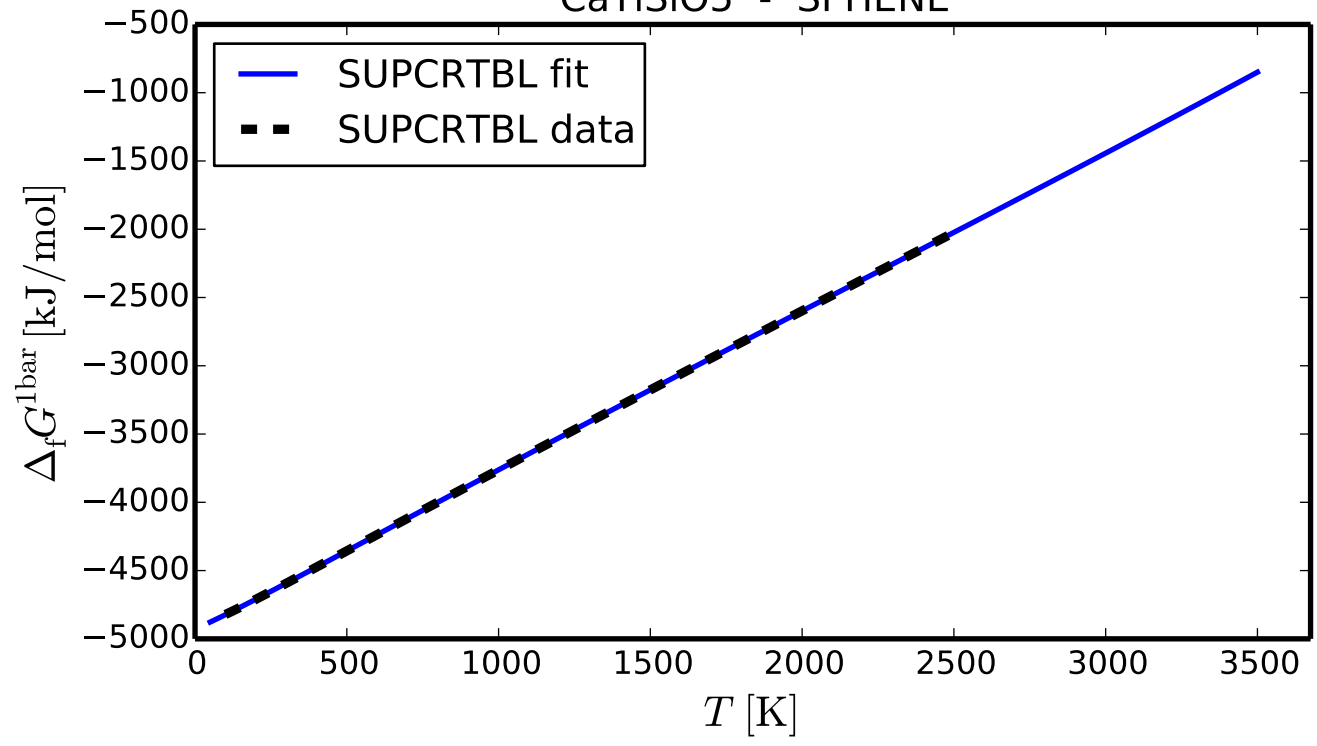


Ca3MgSi2O8 - MERWINITE

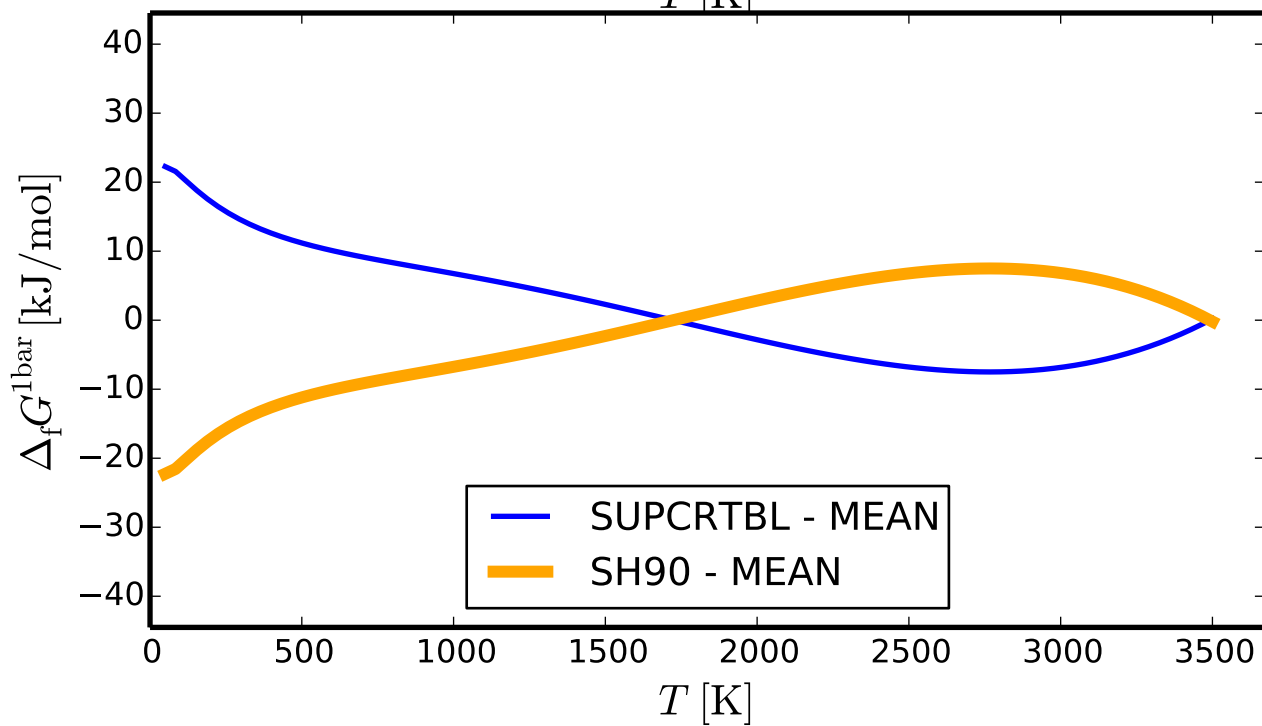
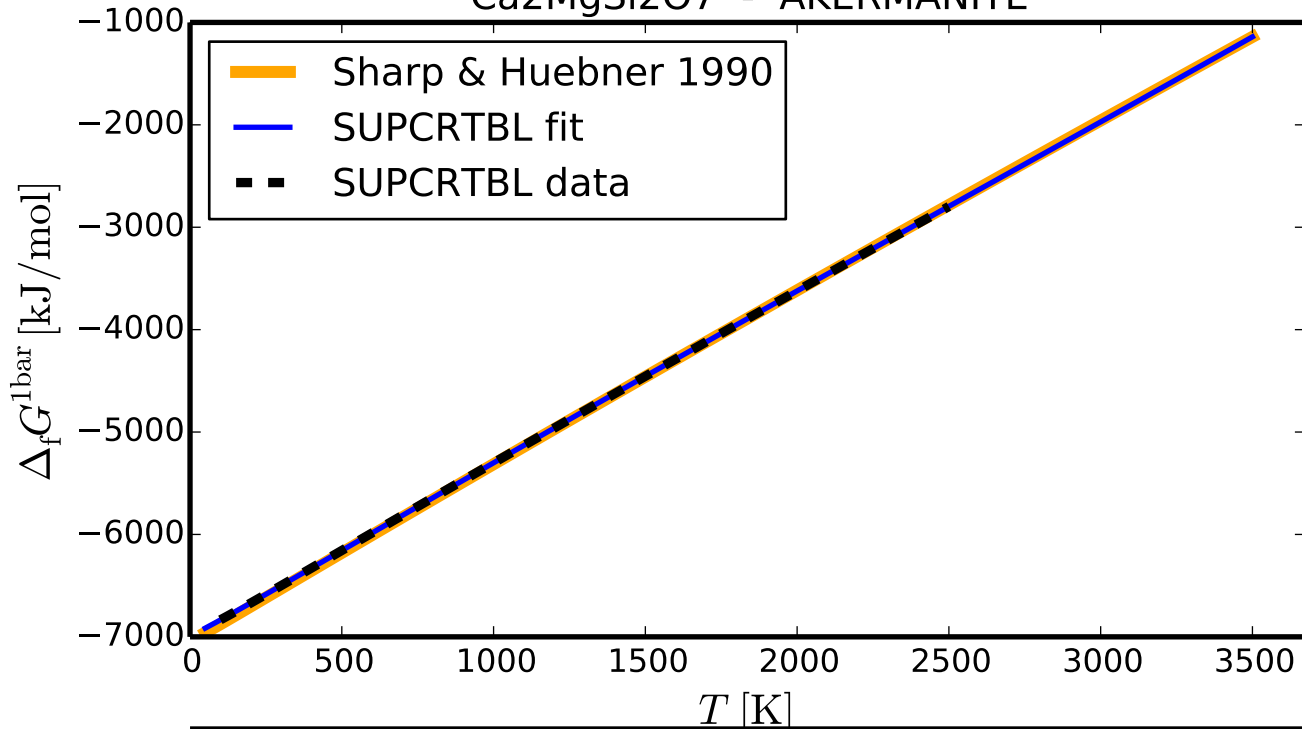


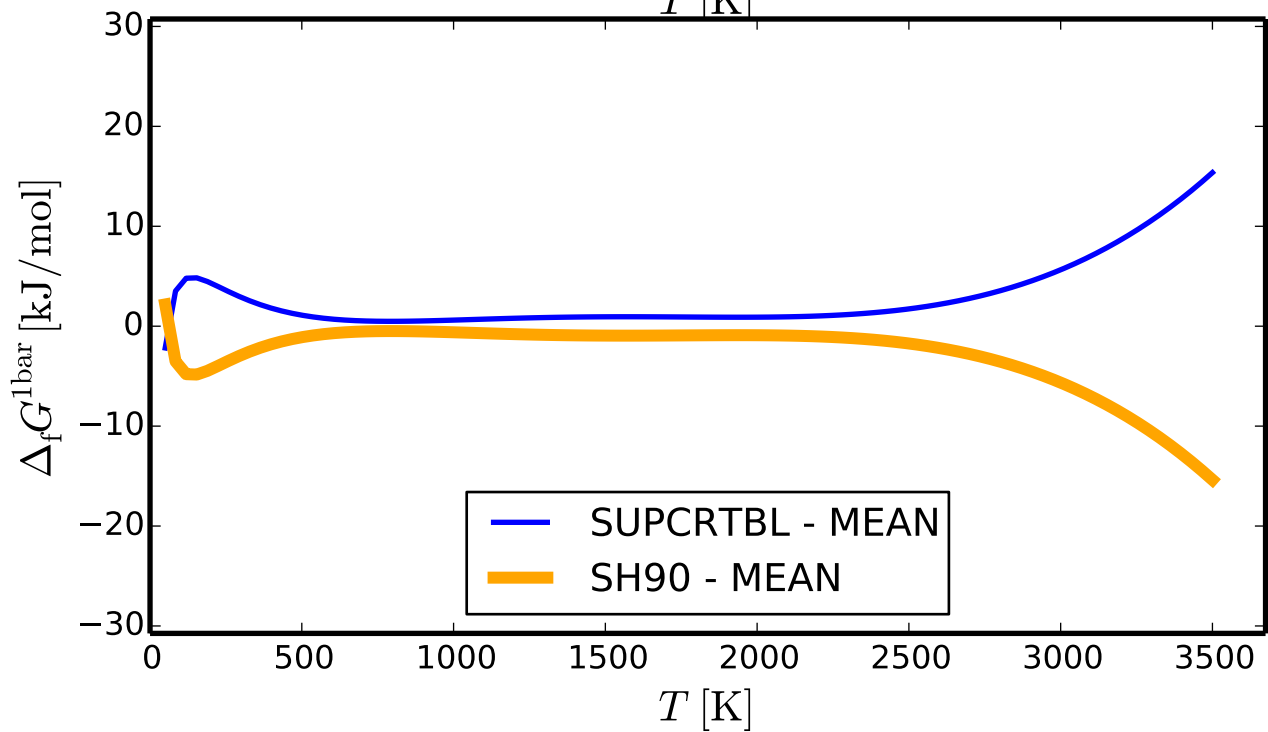
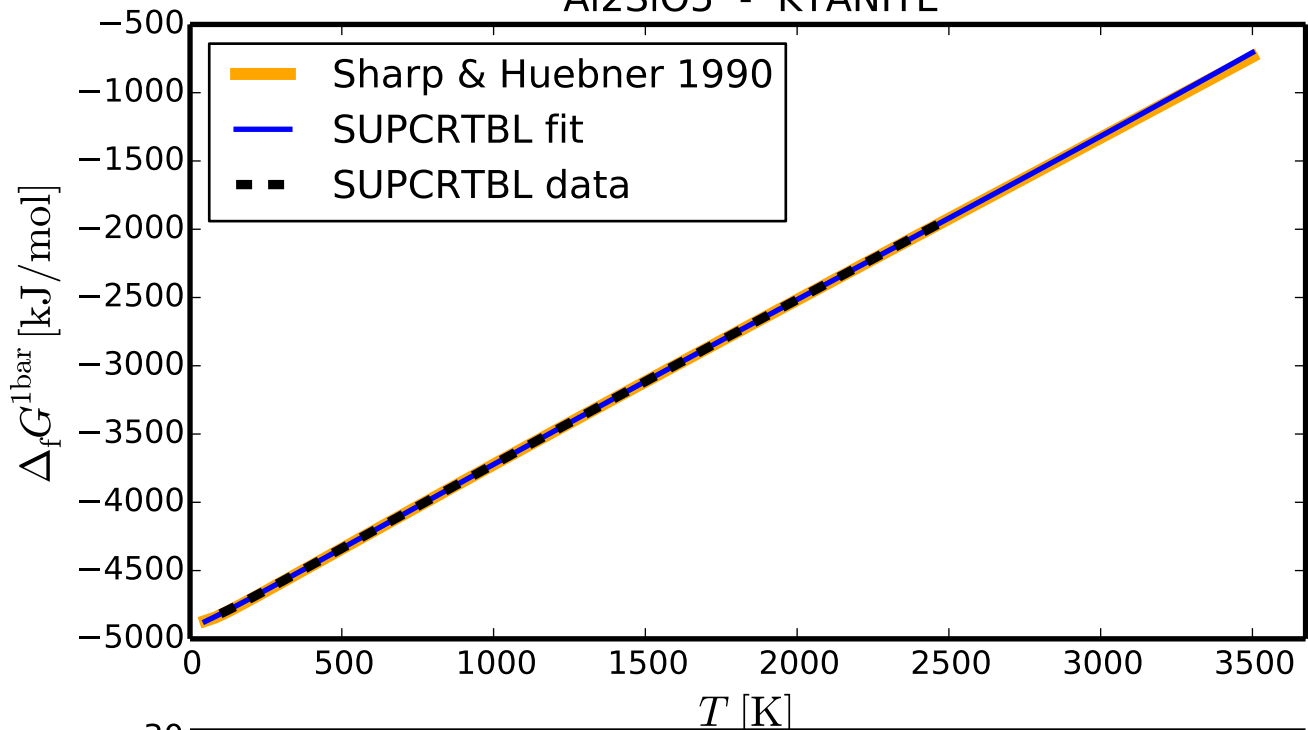
CaAl₂Si₂O₈ - ANORTHITE

CaTiSiO5 - SPHENE

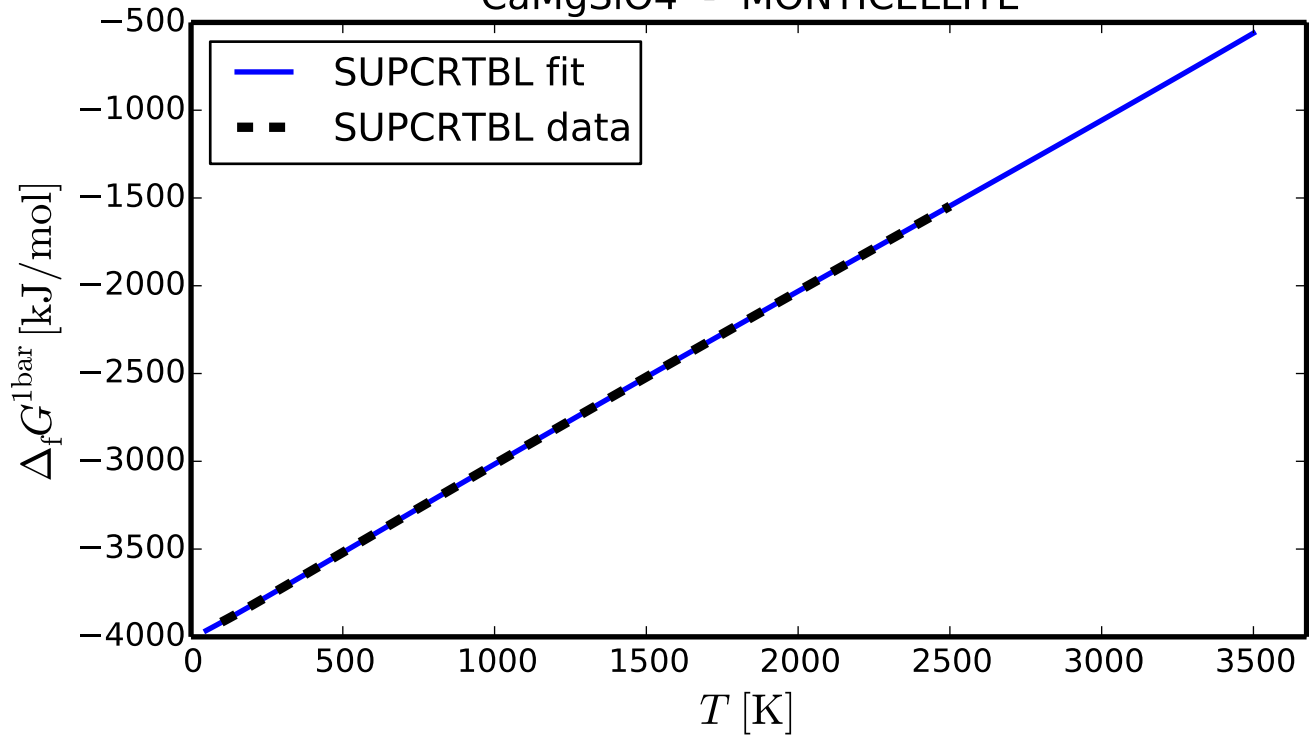


Ca2MgSi2O7 - AKERMANITE

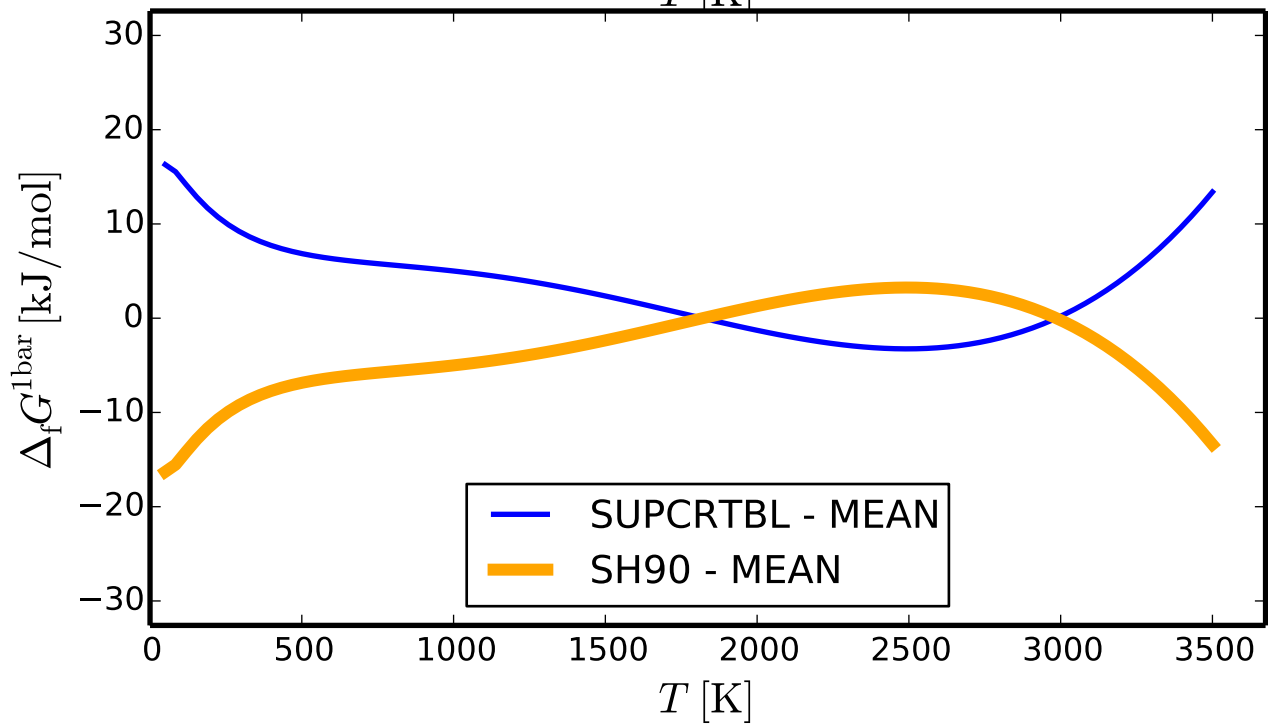
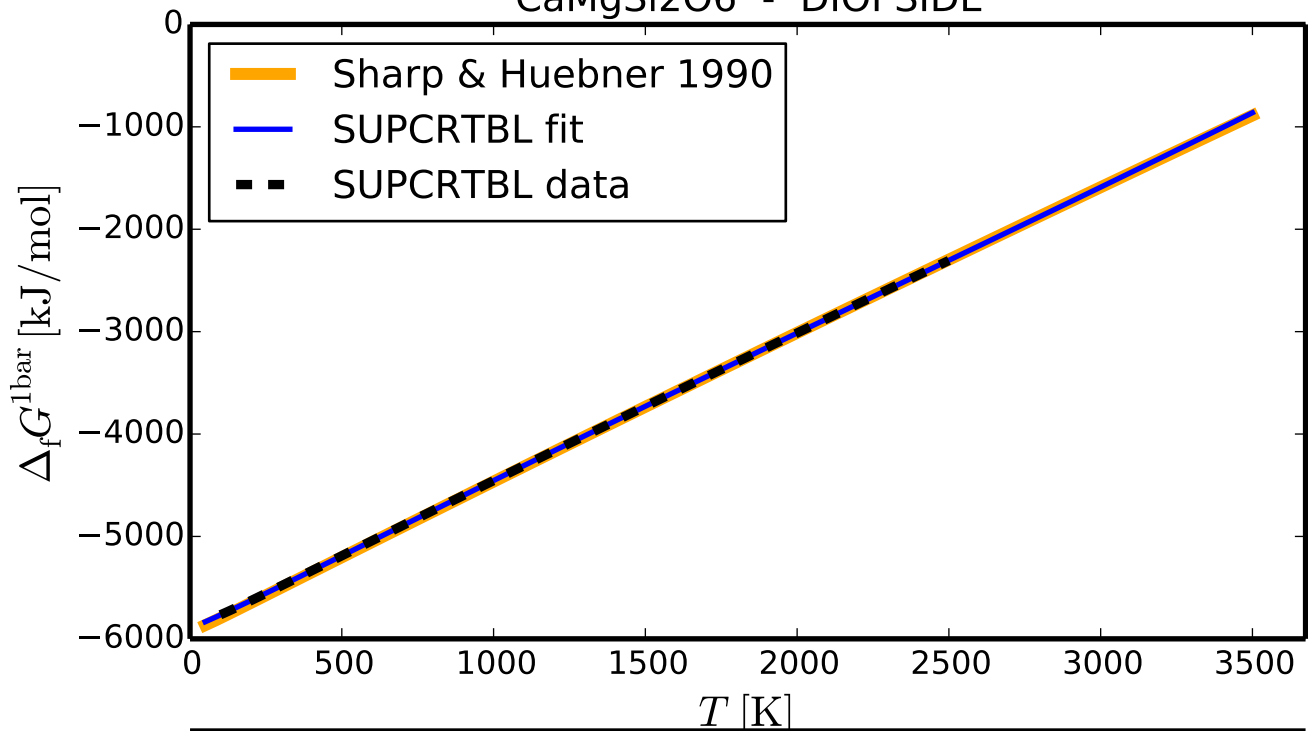


Al₂SiO₅ - KYANITE

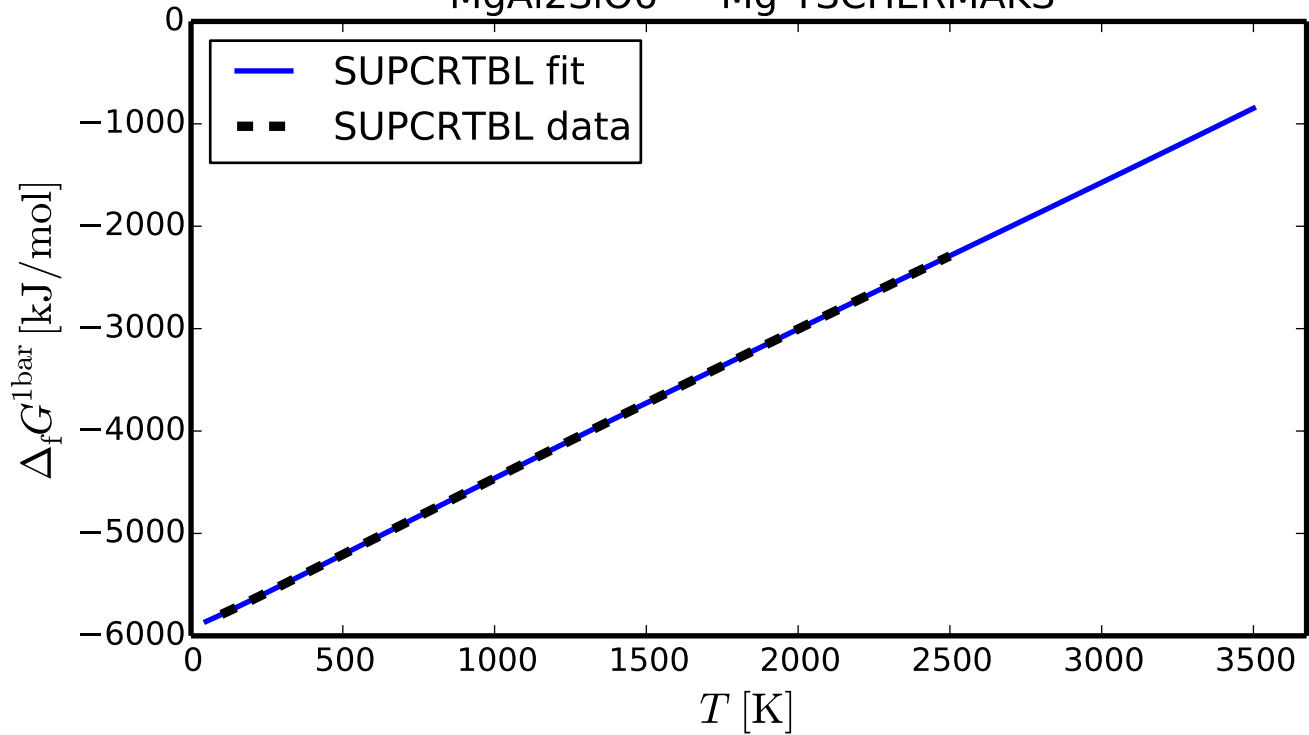
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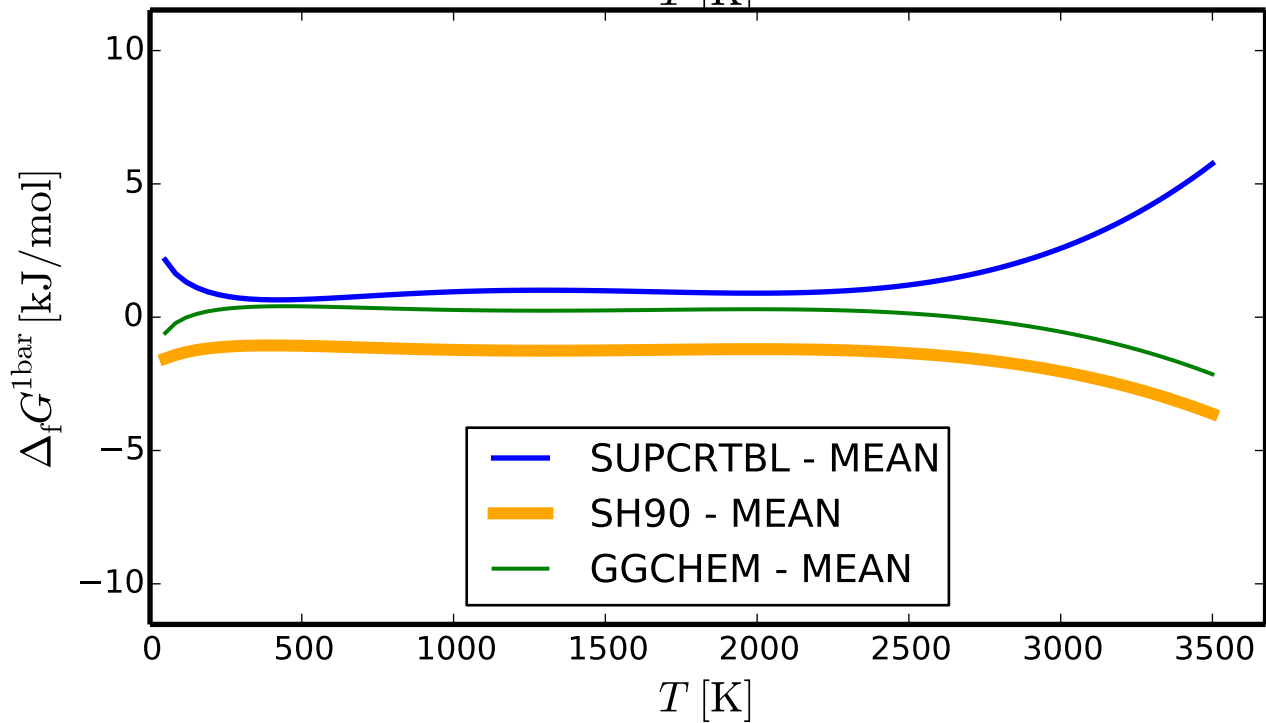
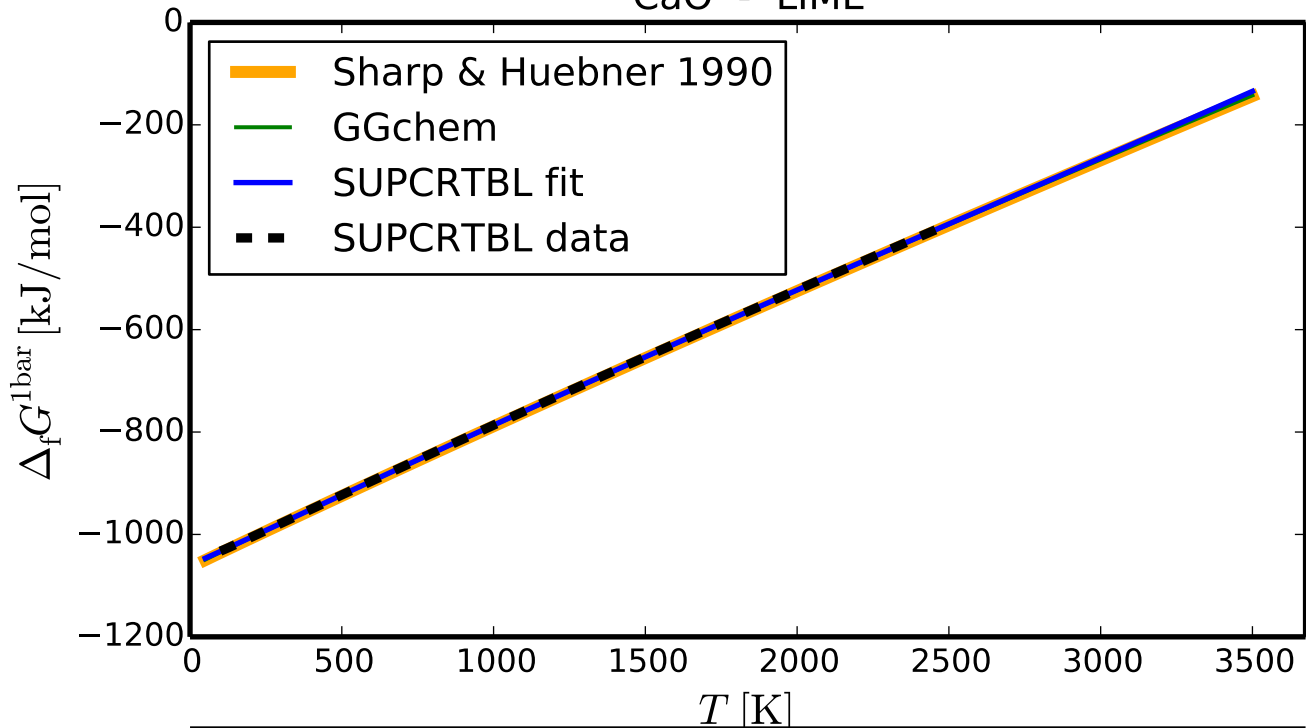
CaMgSi2O6 - DIOPSIDE



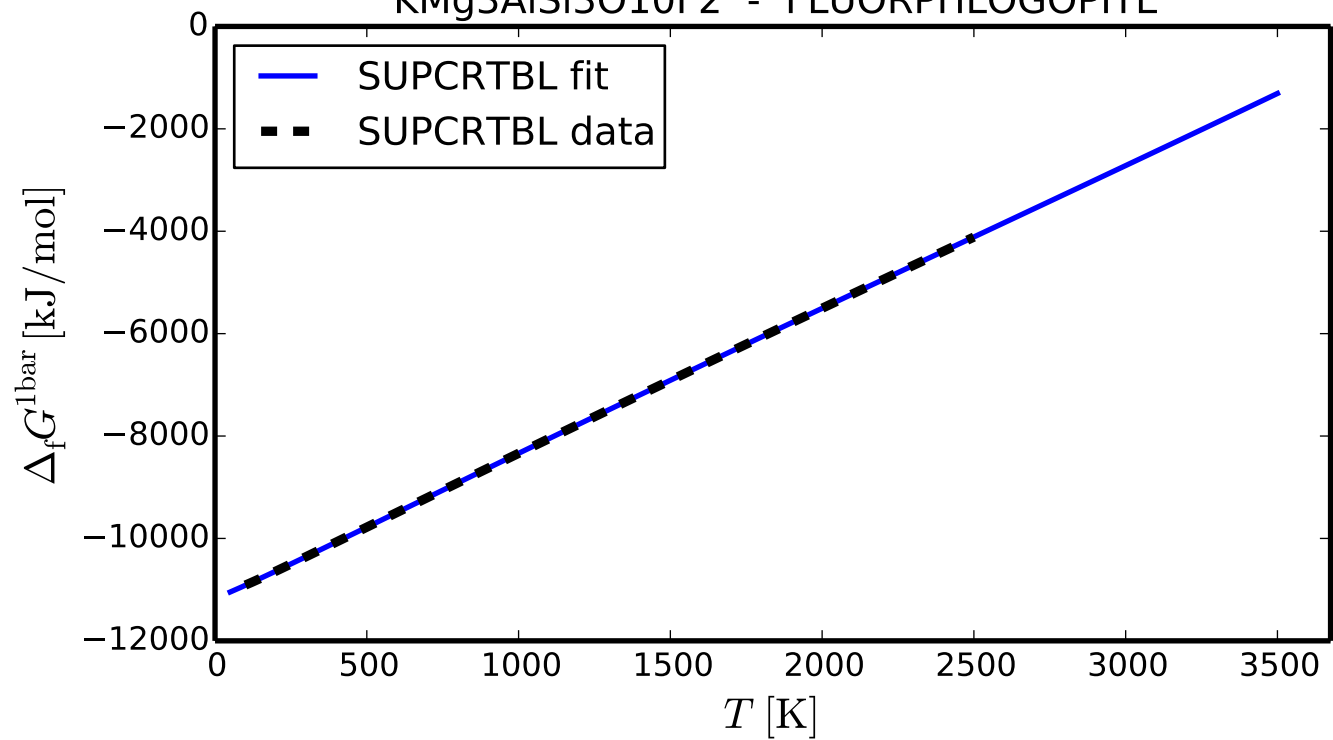
MgAl2SiO6 - Mg-TSCHERMAKS



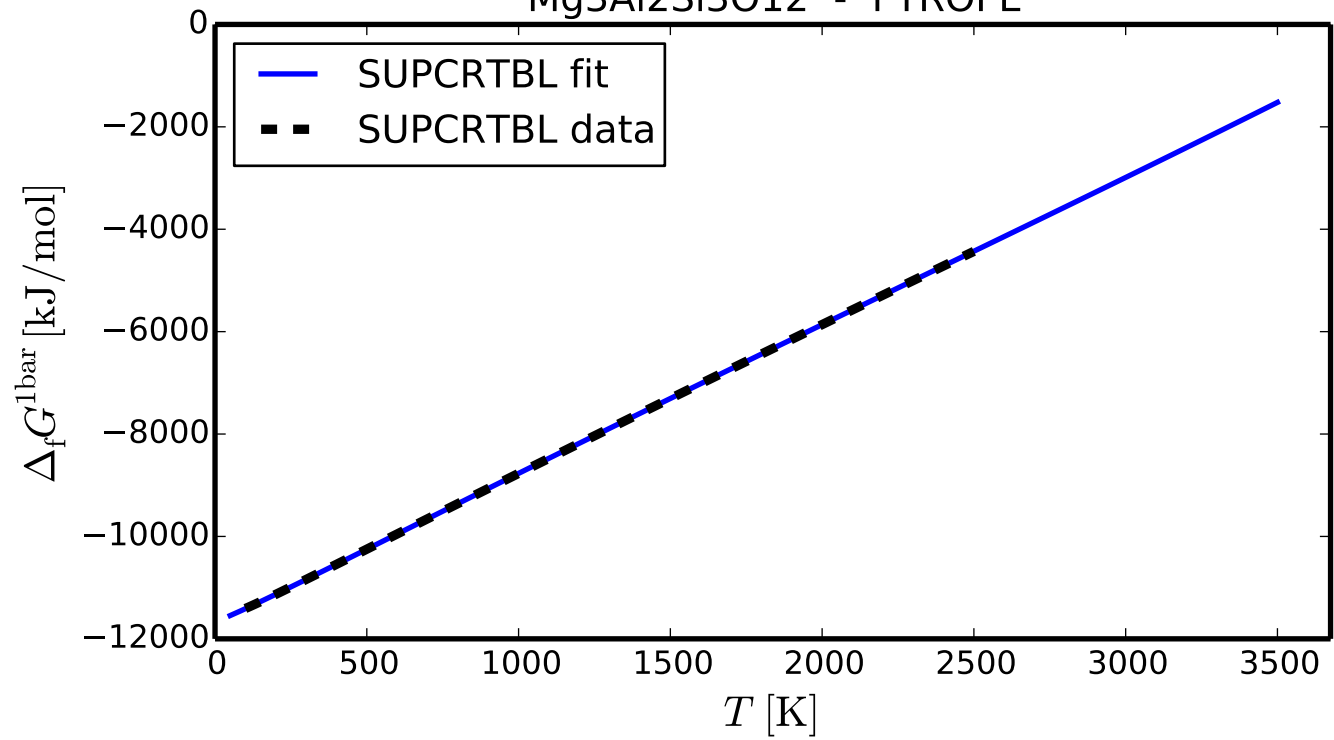
CaO - LIME



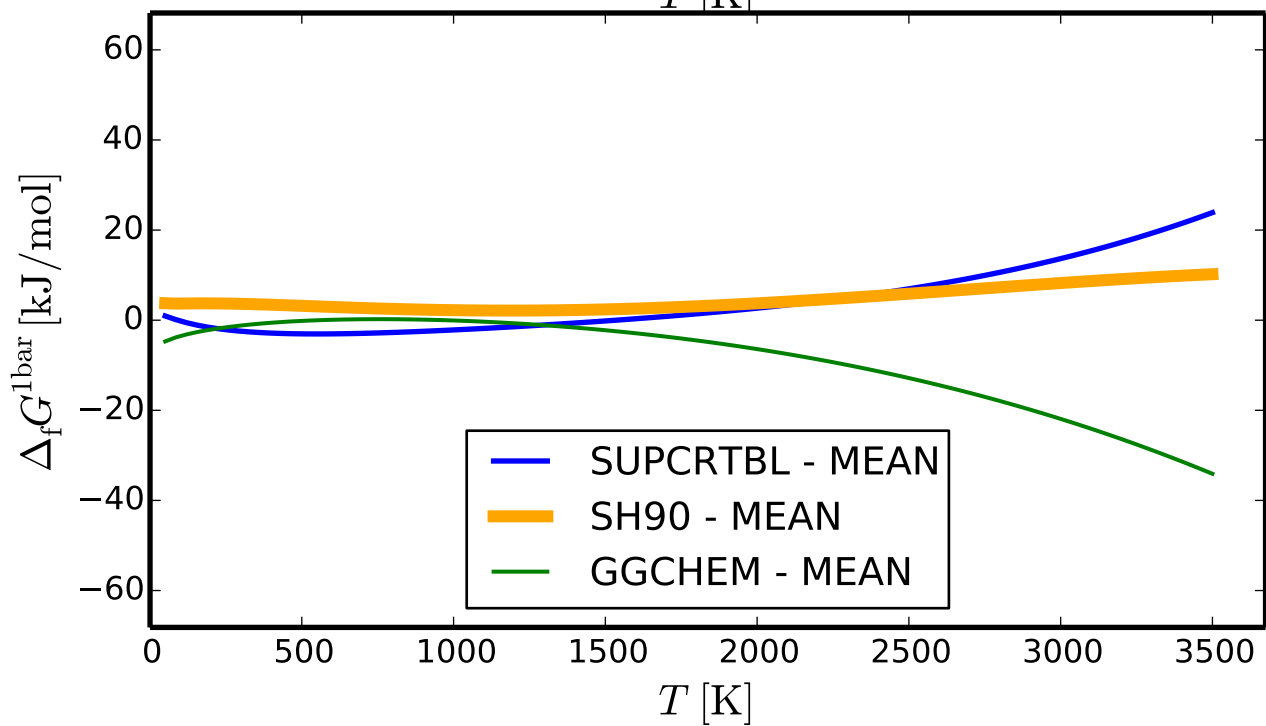
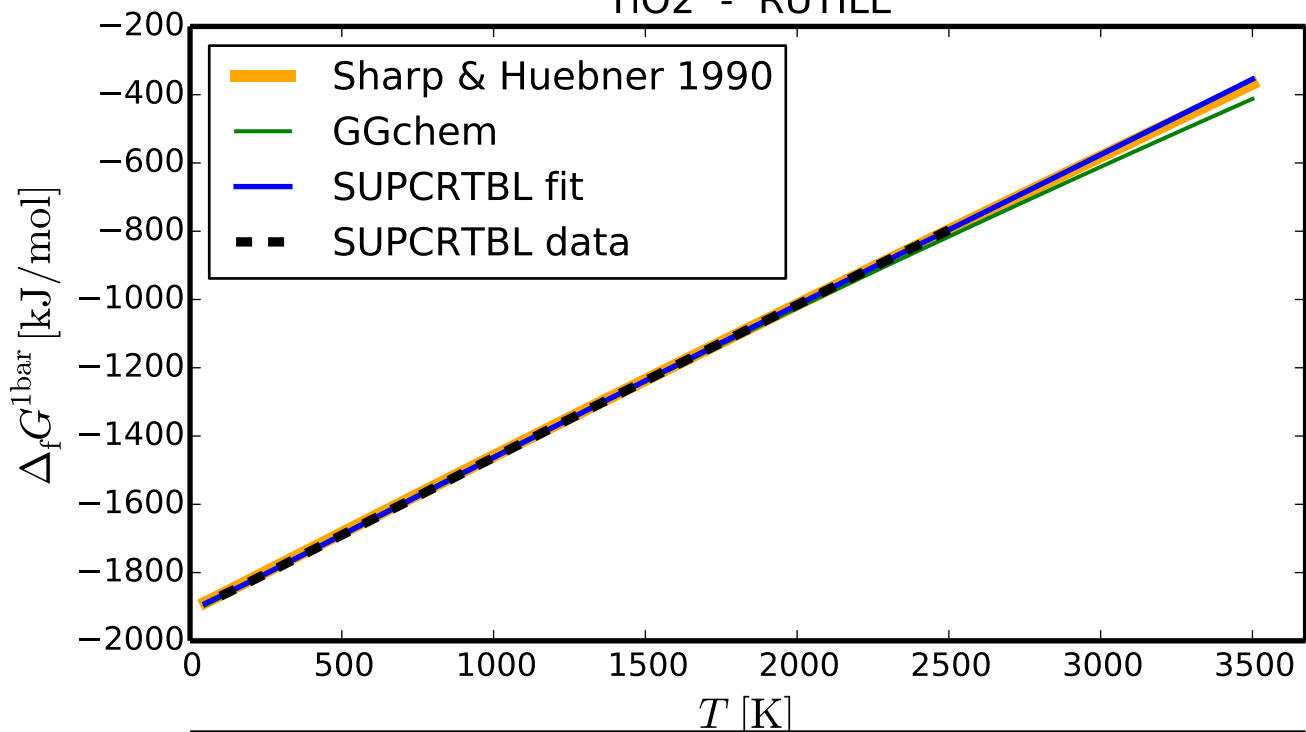
KMg3AlSi3O10F2 - FLUORPHLOGOPITE



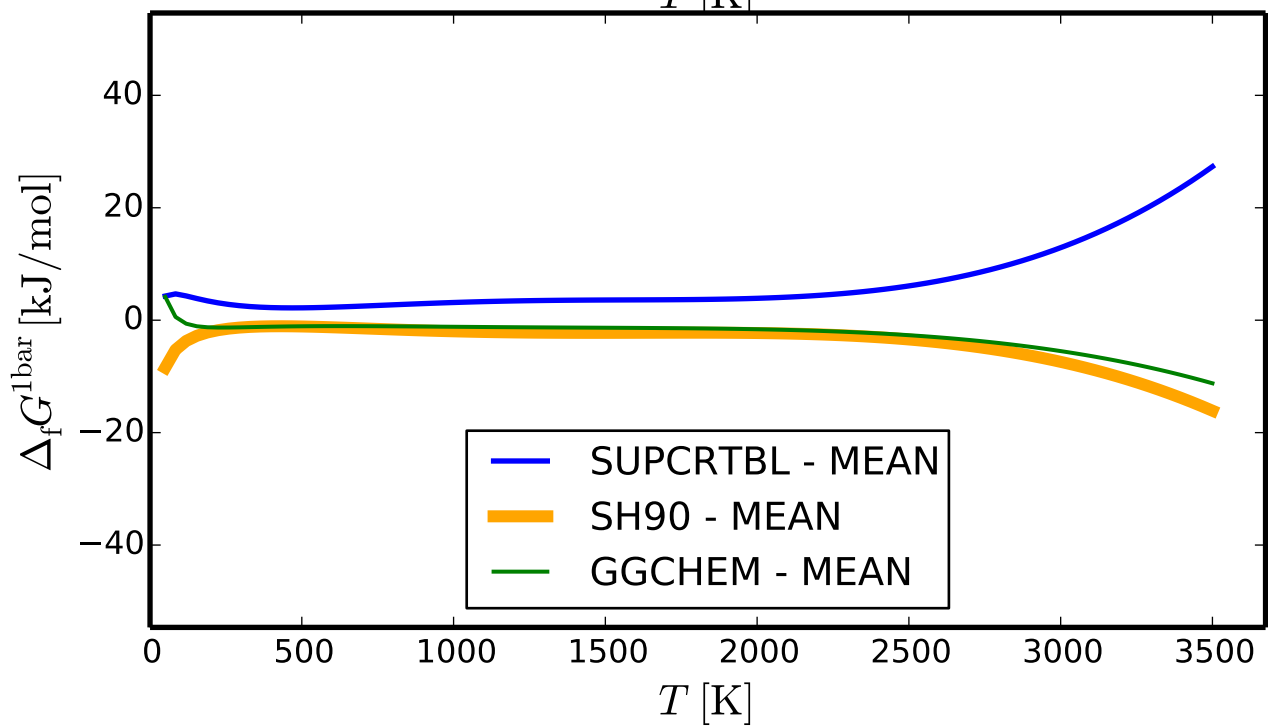
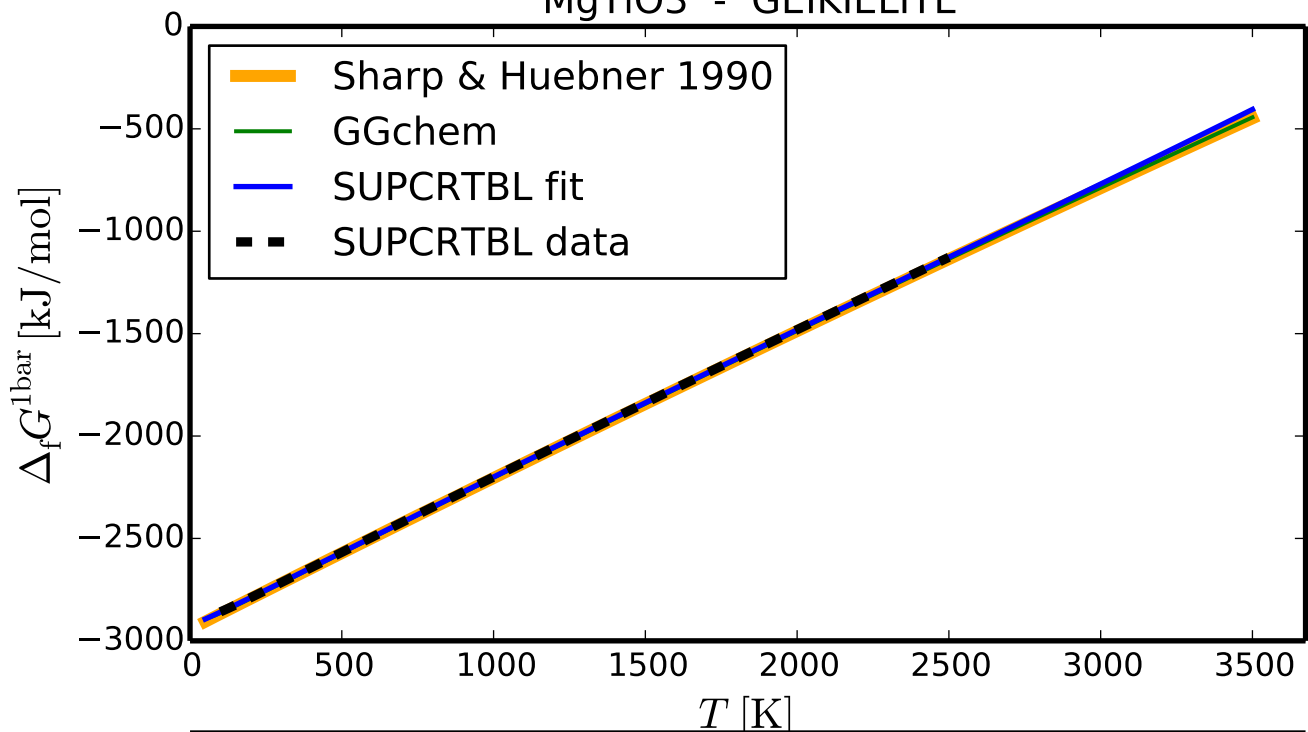
Mg₃Al₂Si₃O₁₂ - PYROPE



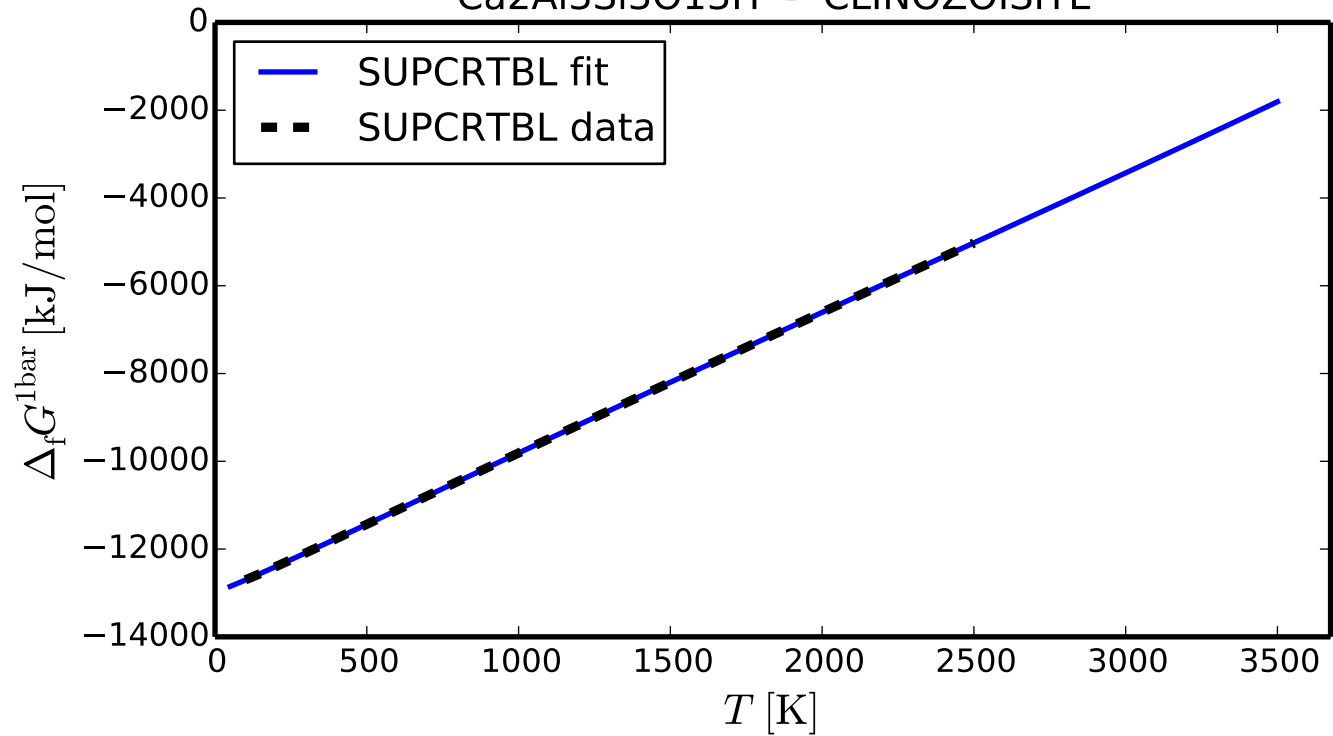
TiO2 - RUTILE



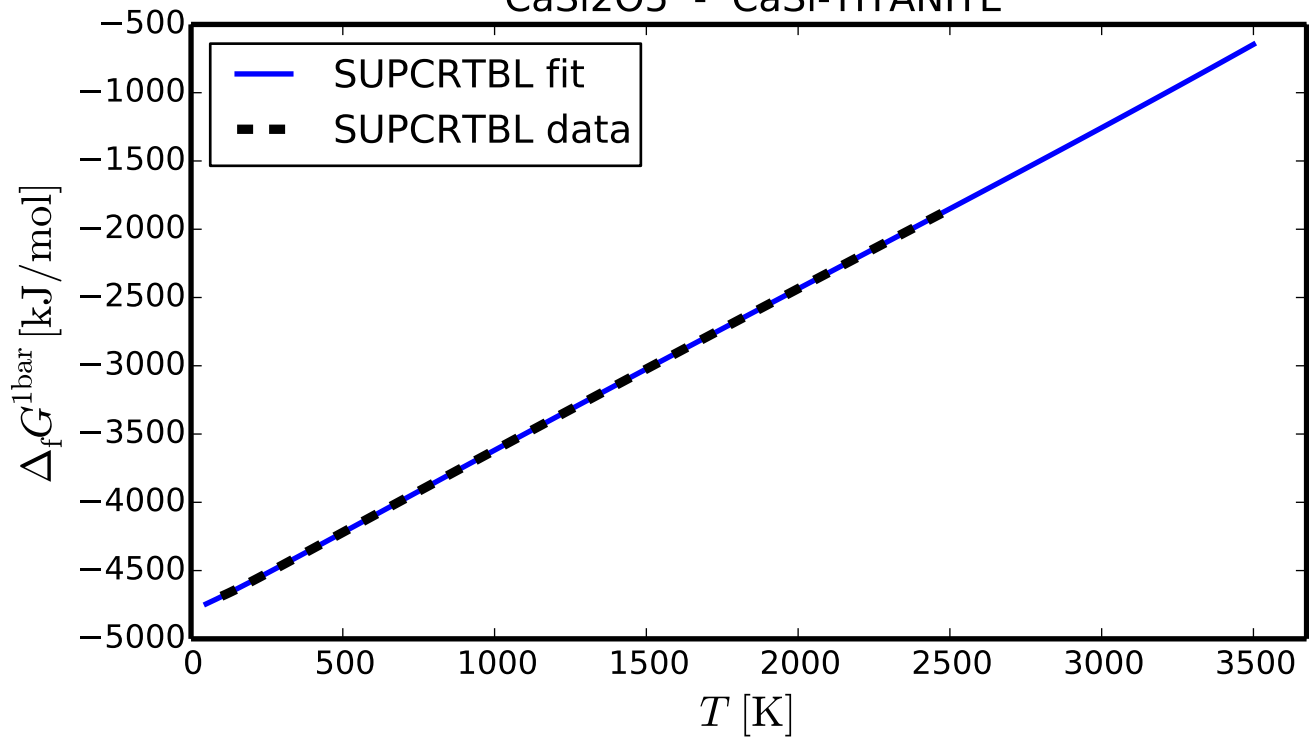
MgTiO3 - GEIKIELITE

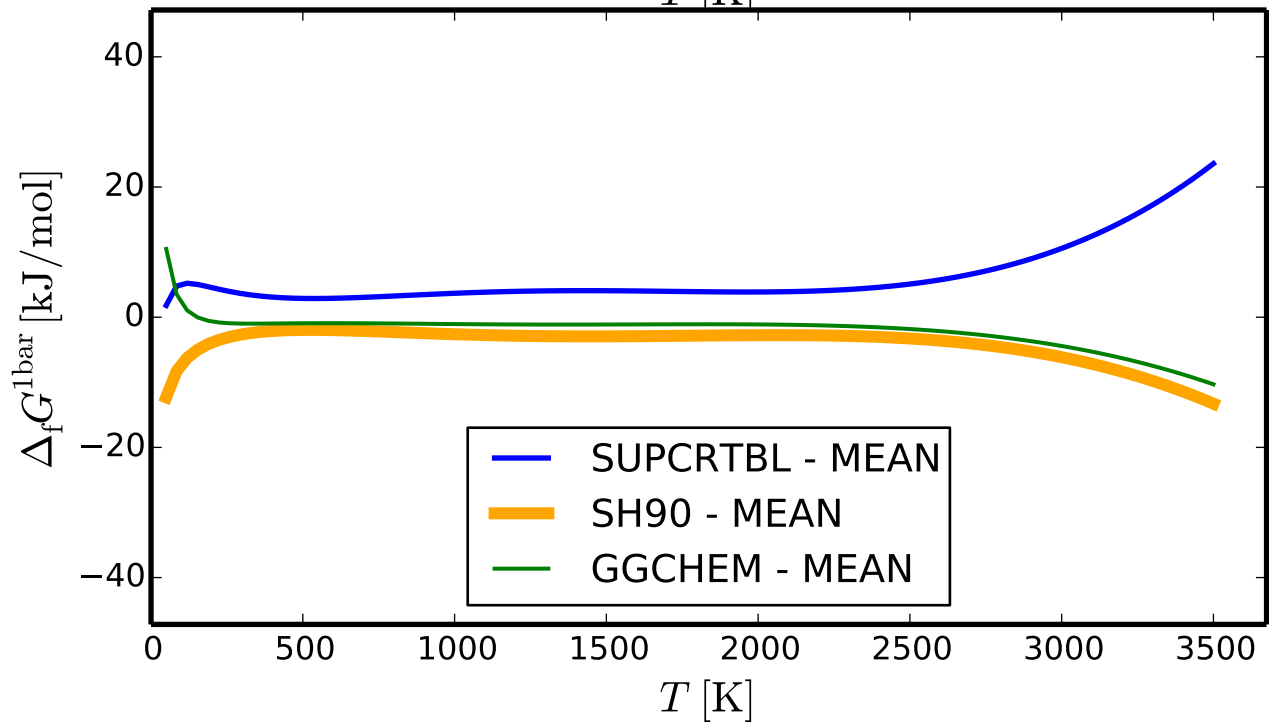
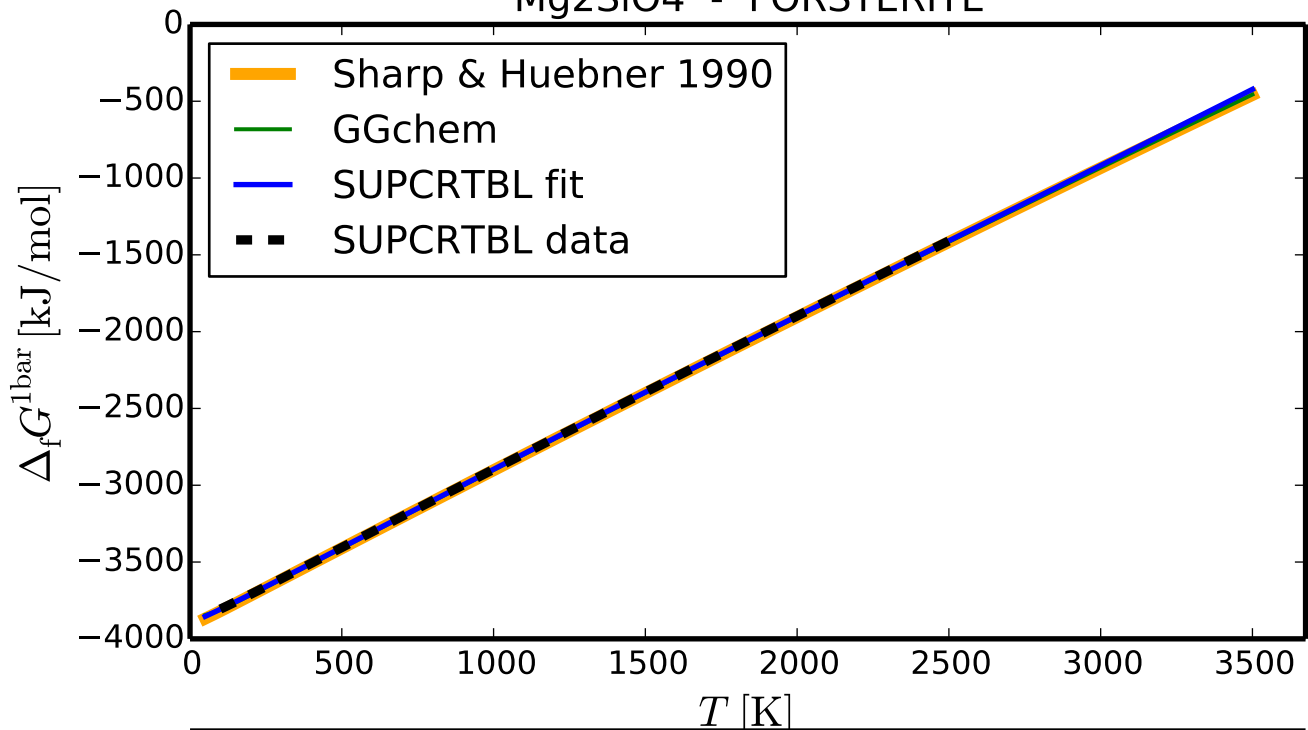


Ca2Al3Si3O13H - CLINOZOISITE

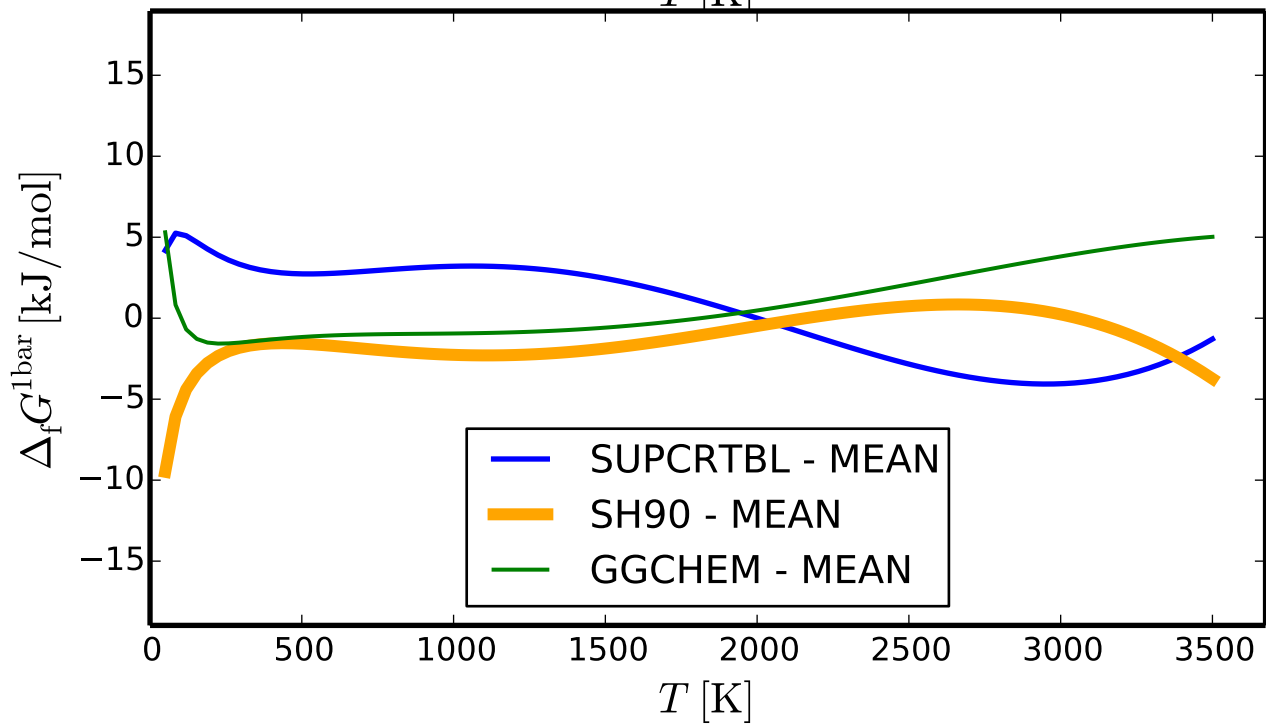
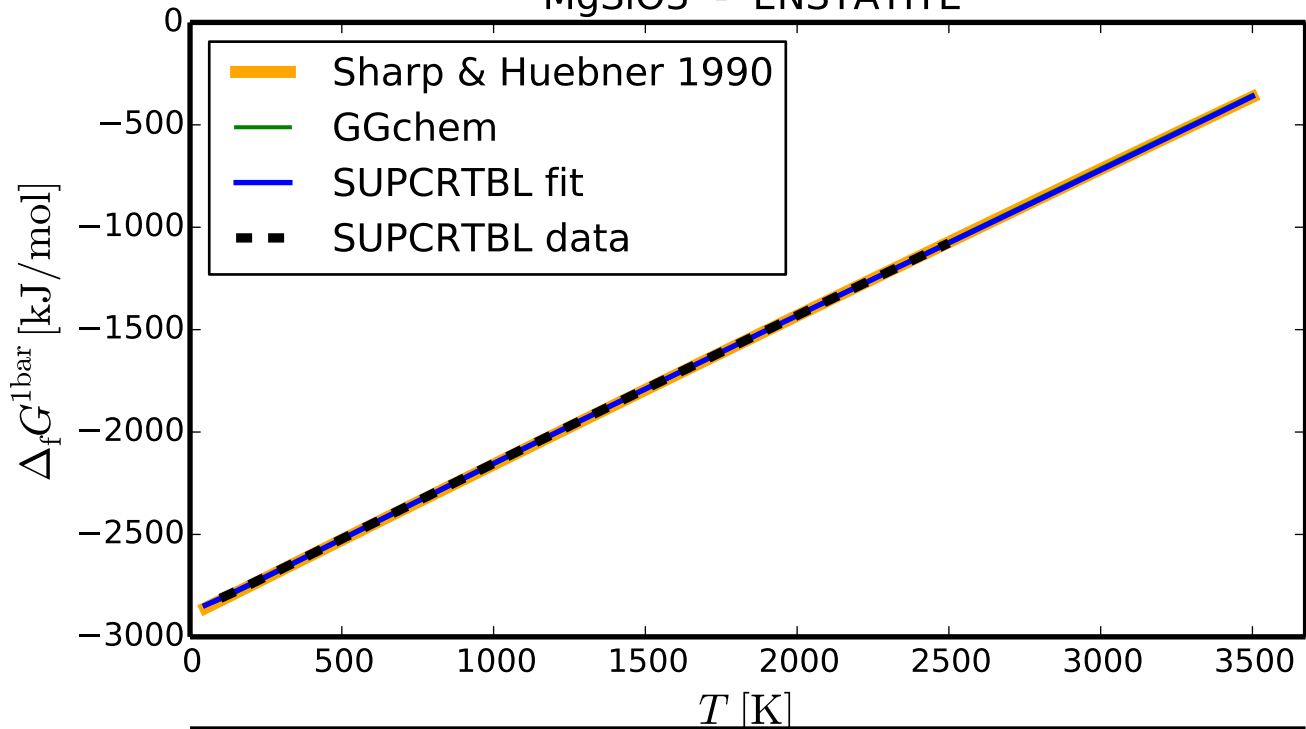


CaSi2O5 - CaSi-TITANITE

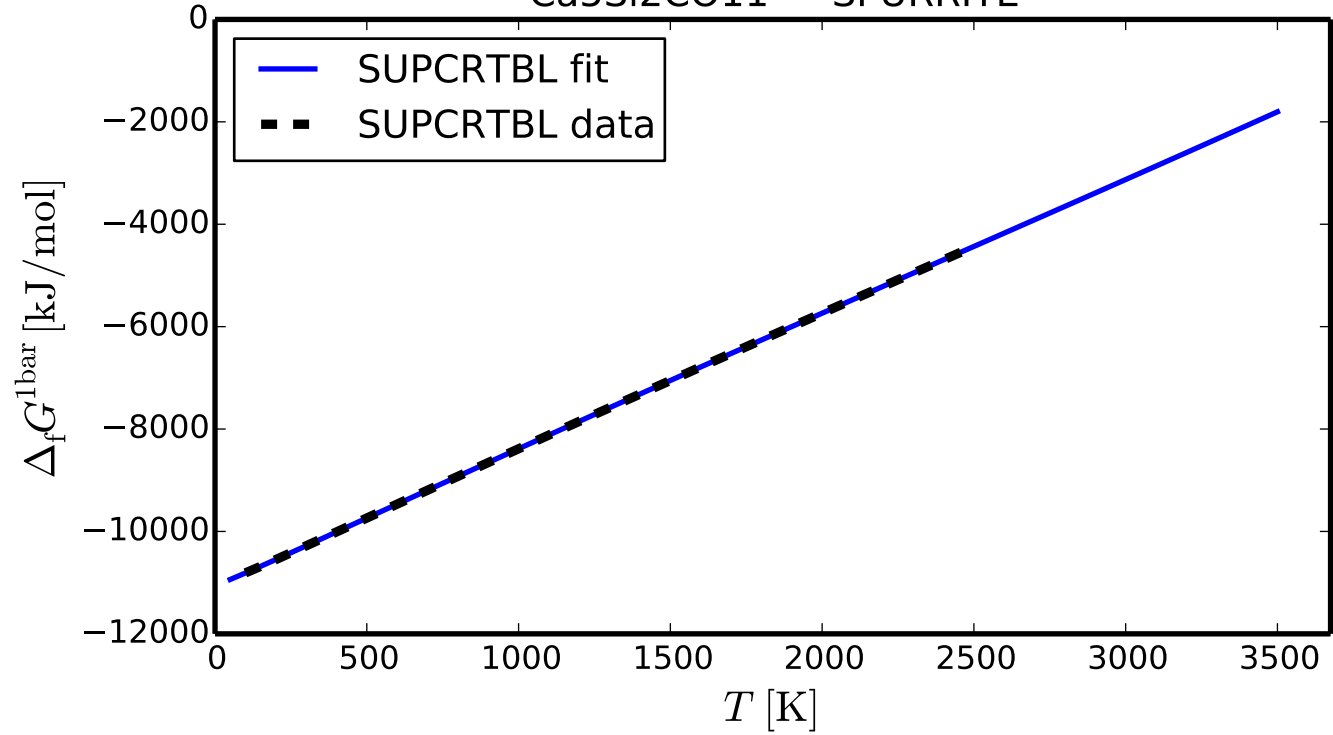


Mg₂SiO₄ - FORSTERITE

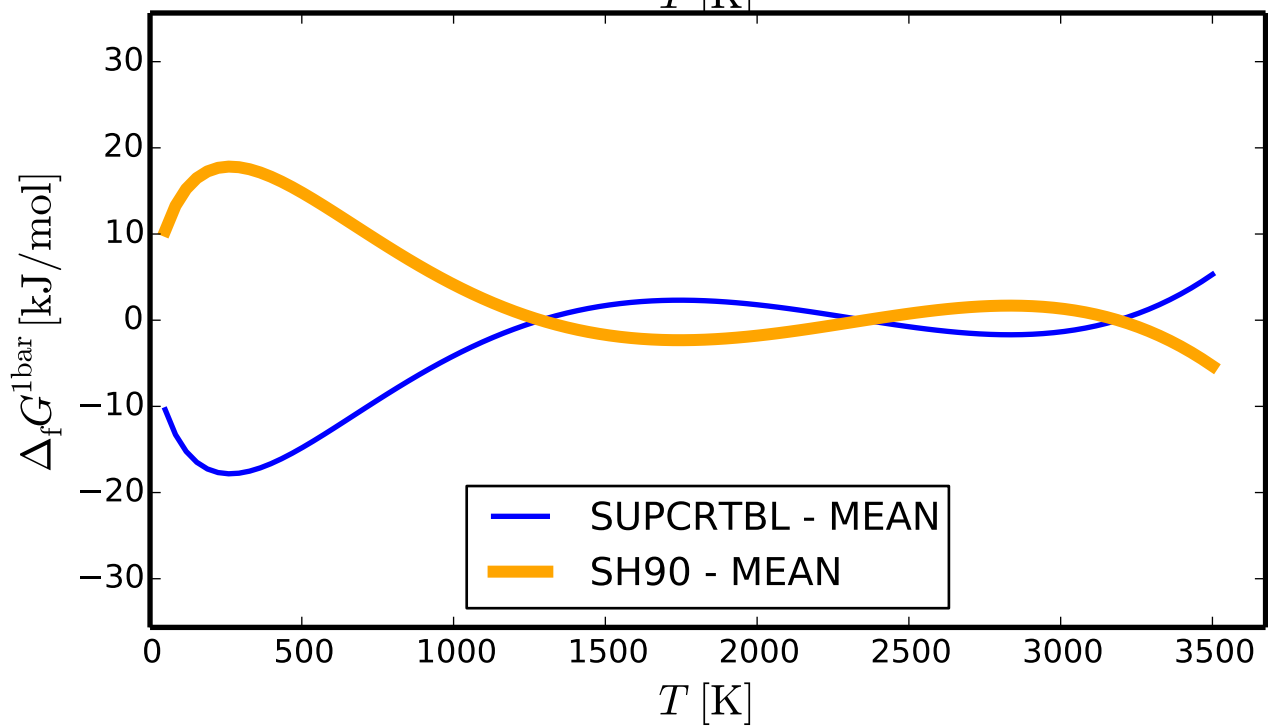
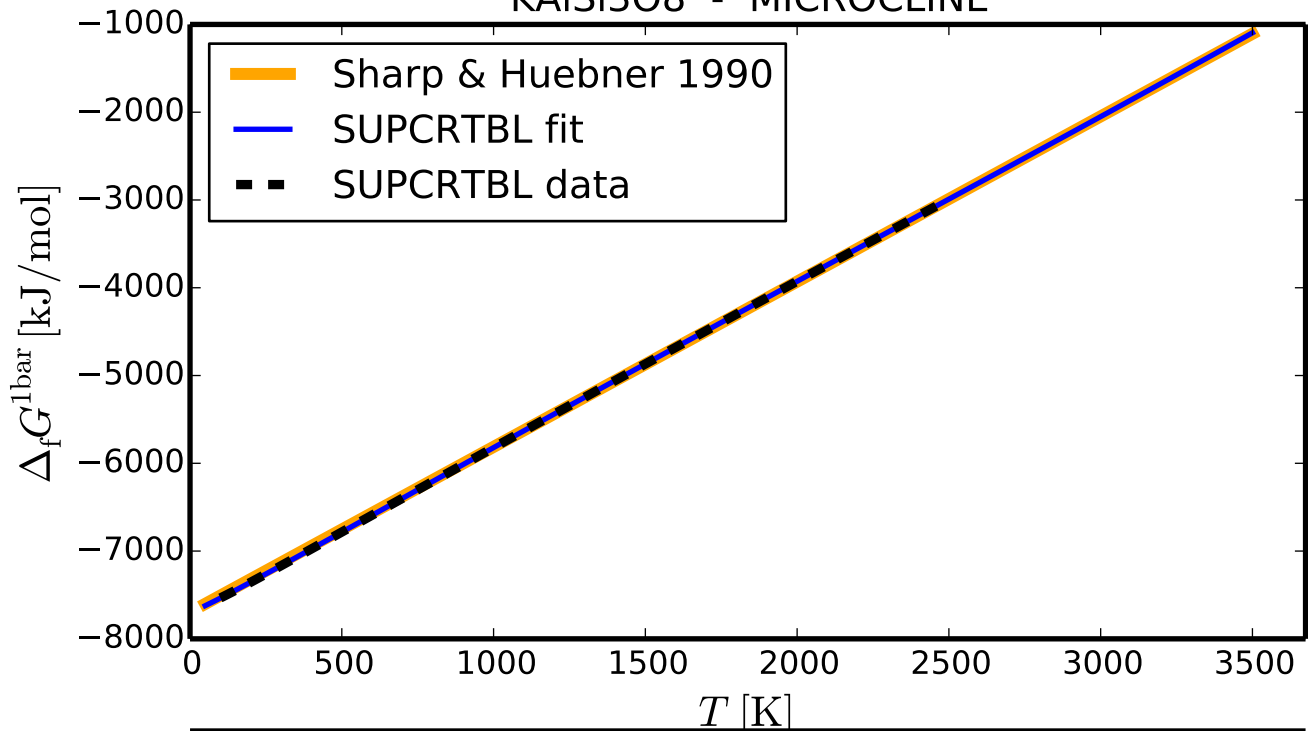
MgSiO3 - ENSTATITE



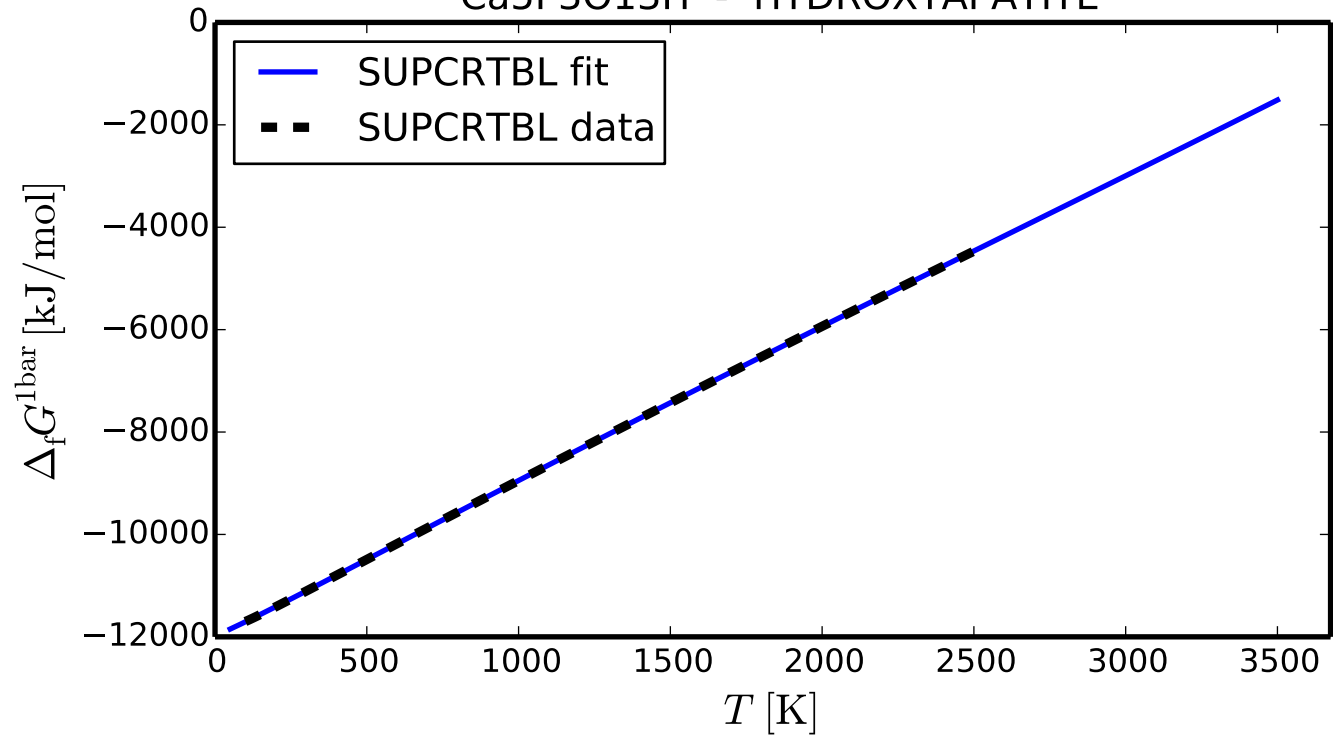
Ca5Si2CO11 - SPURRITE



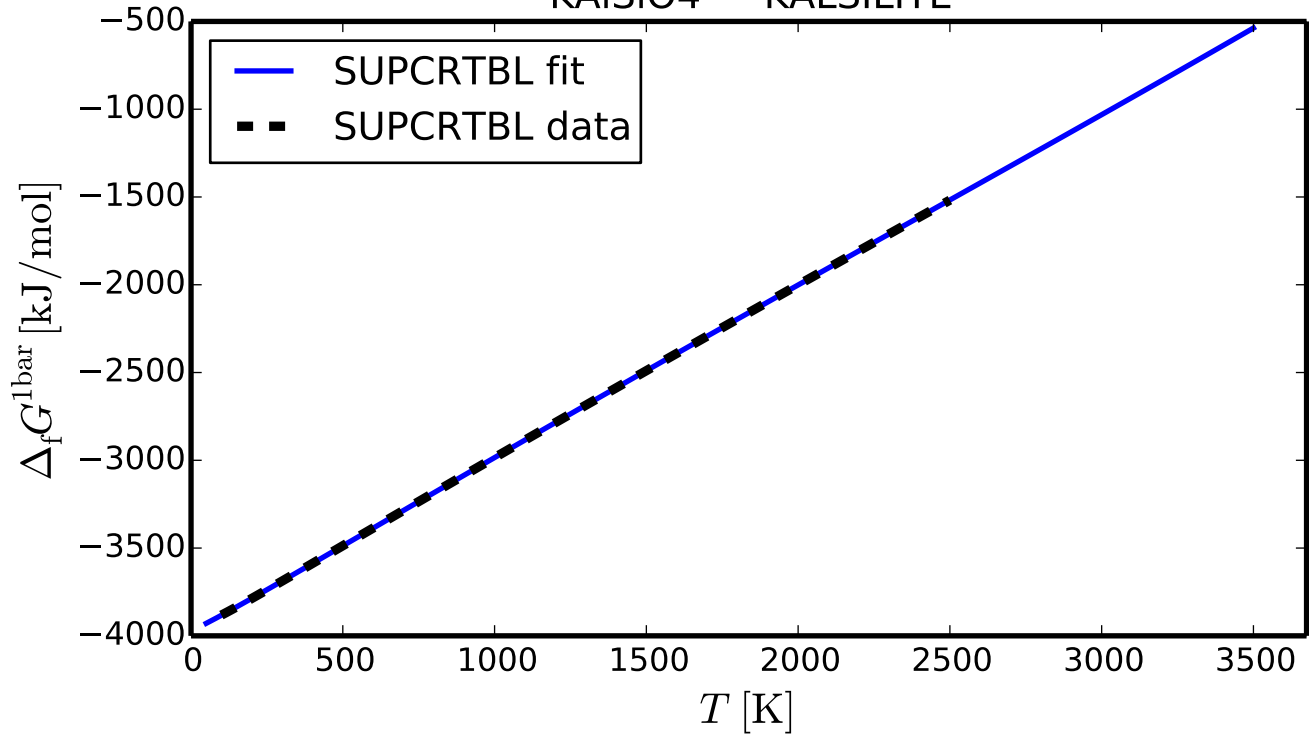
KAISi3O8 - MICROCLINE



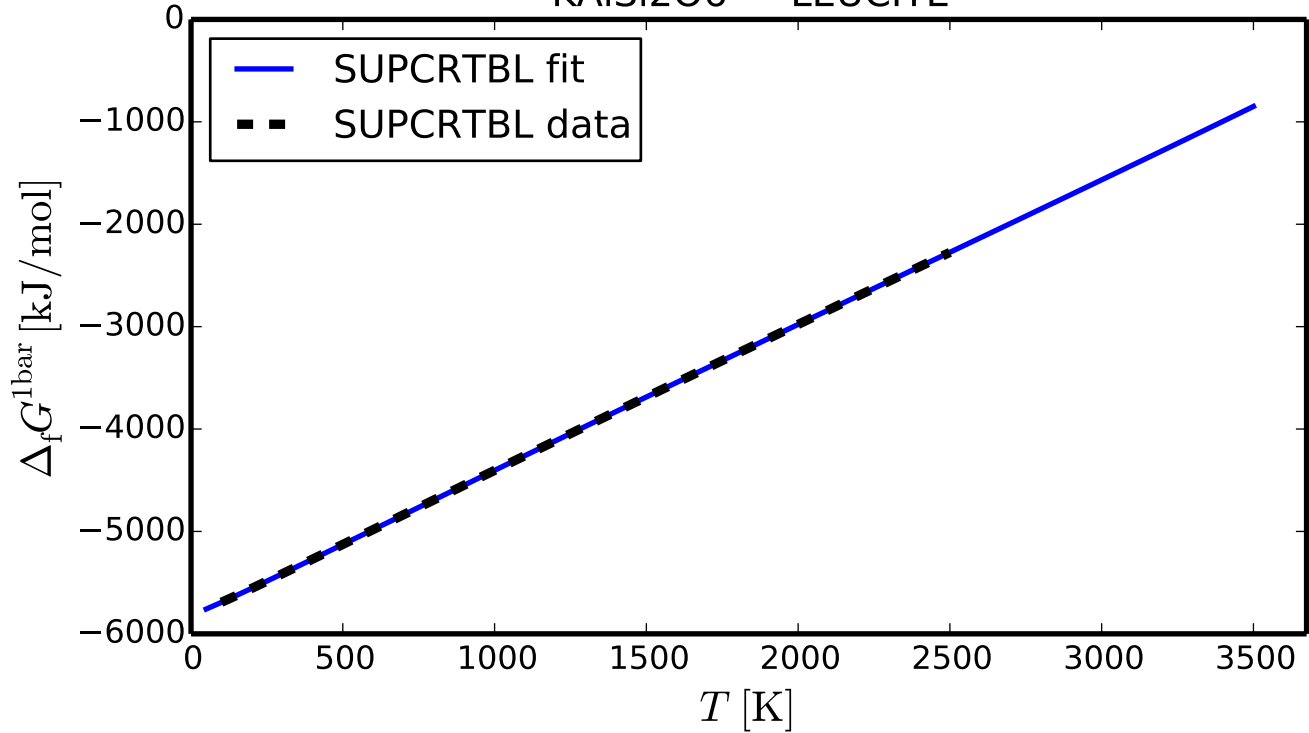
Ca5P3O13H - HYDROXYAPATITE



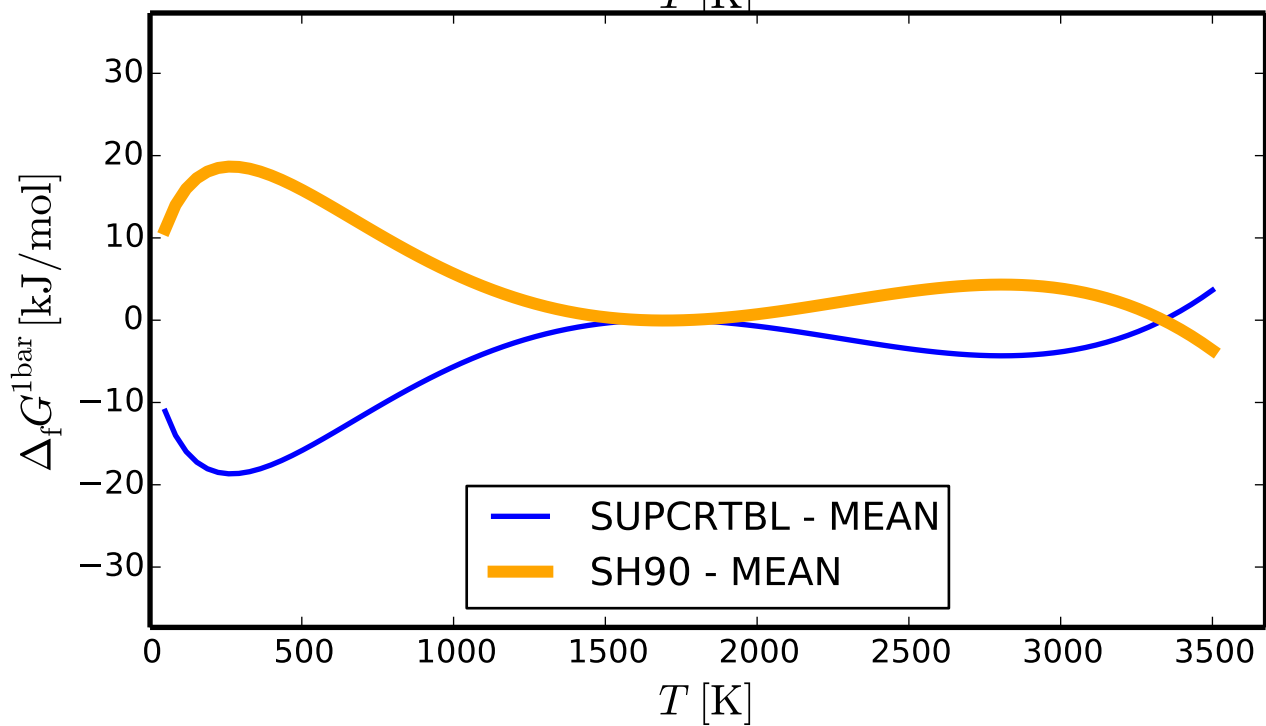
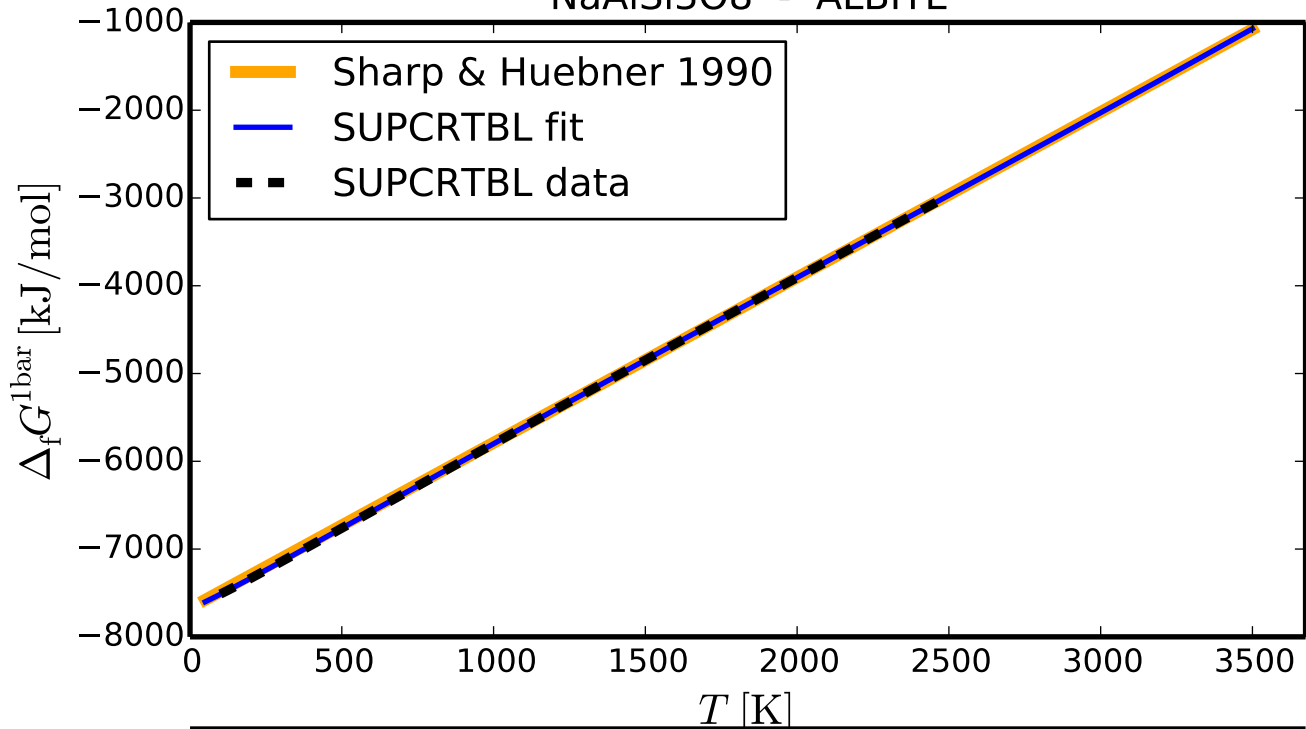
KAlSiO4 - KALSILITE

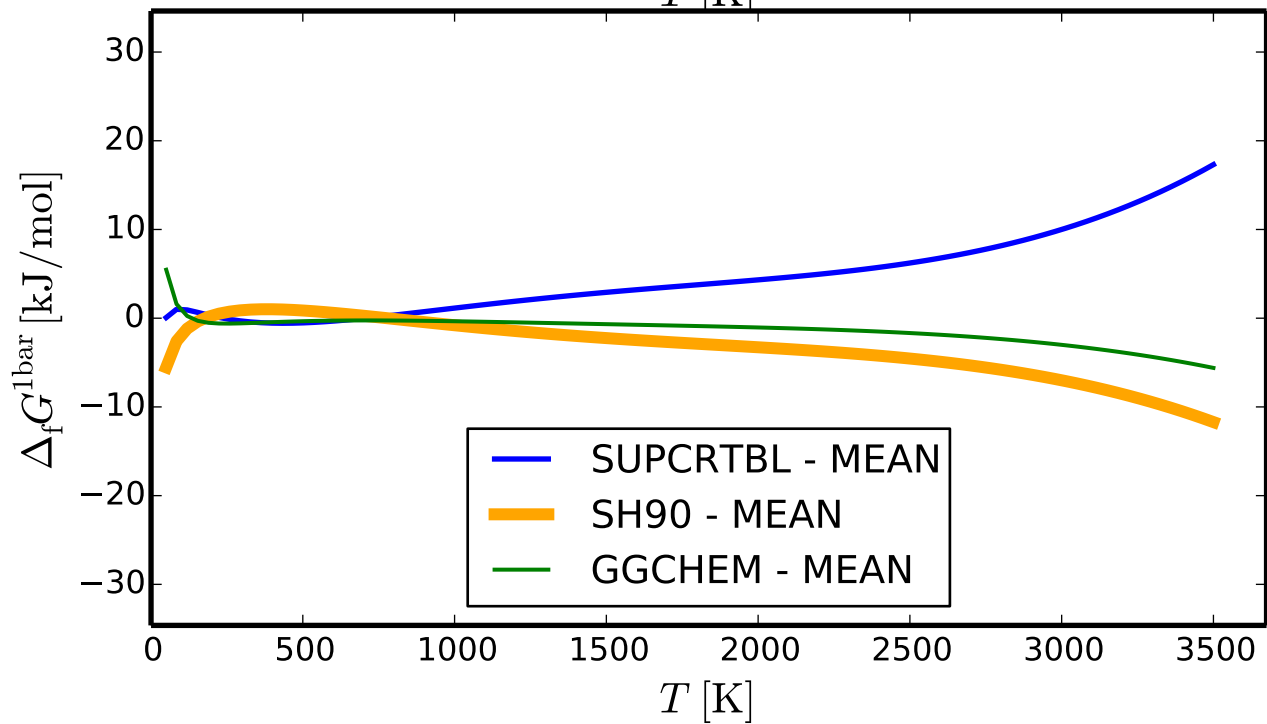
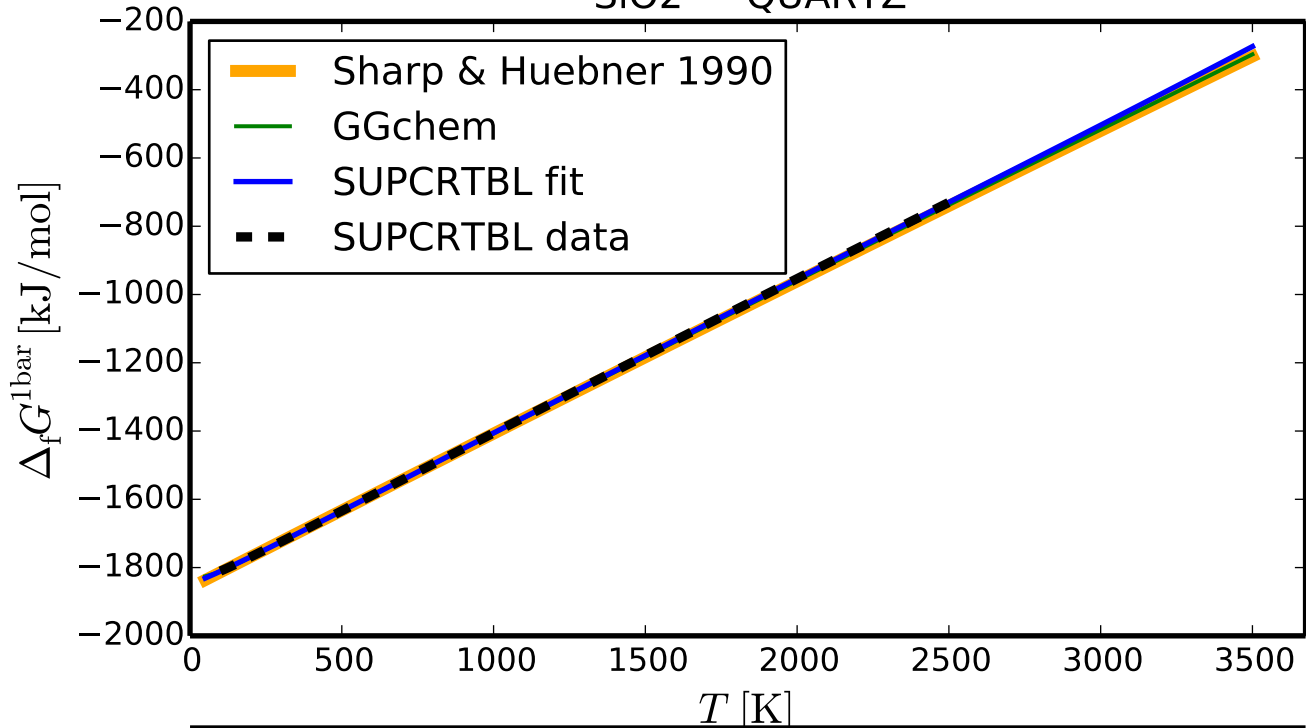


KAlSi2O6 - LEUCITE

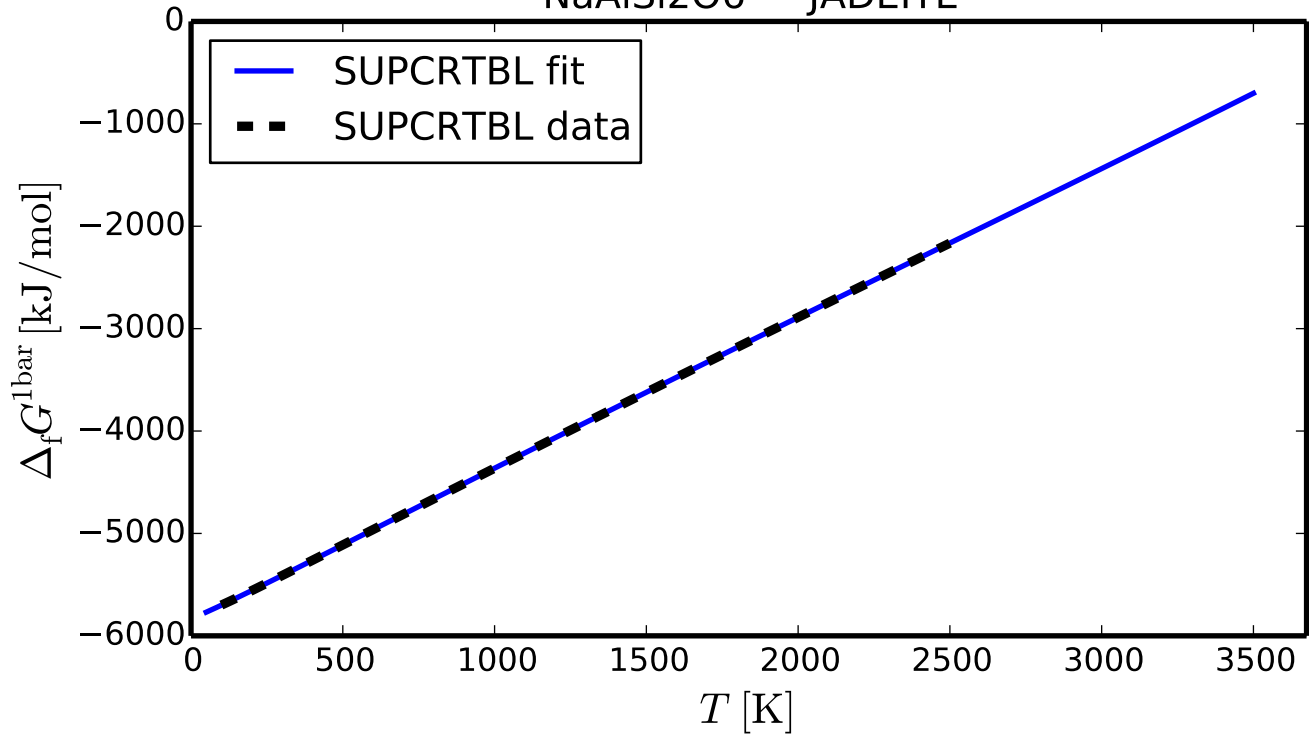


NaAlSi3O8 - ALBITE

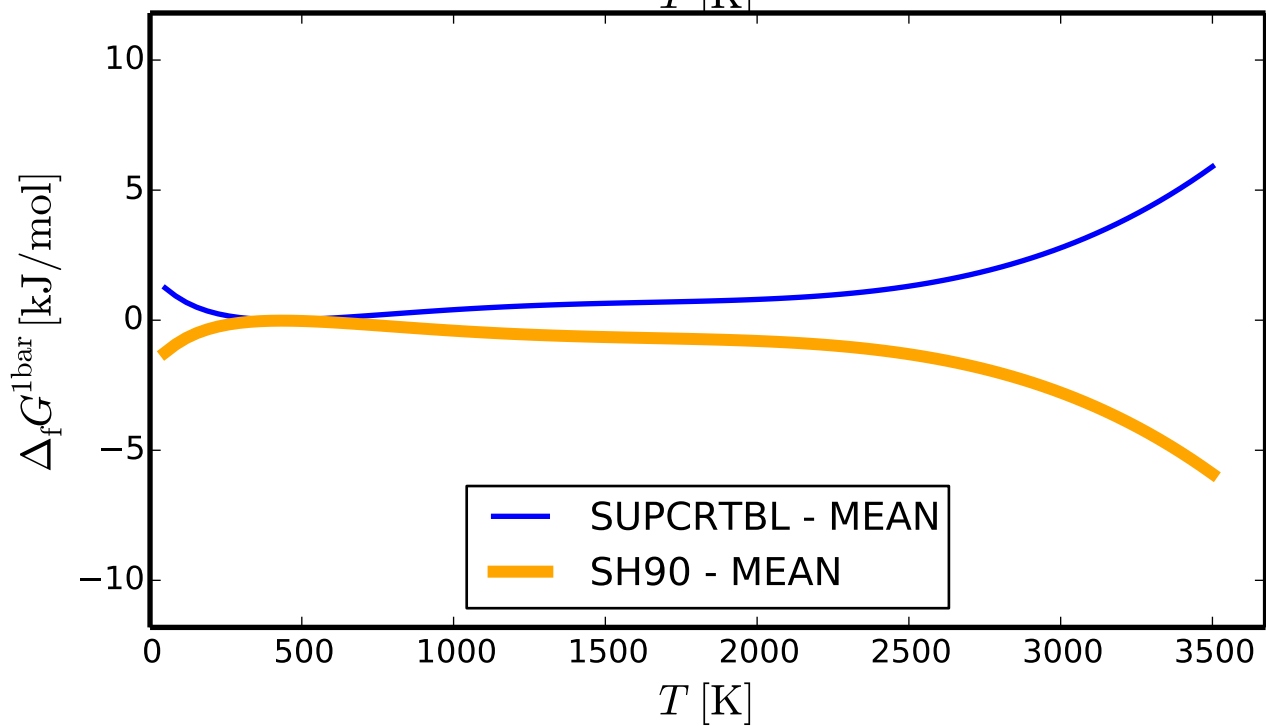
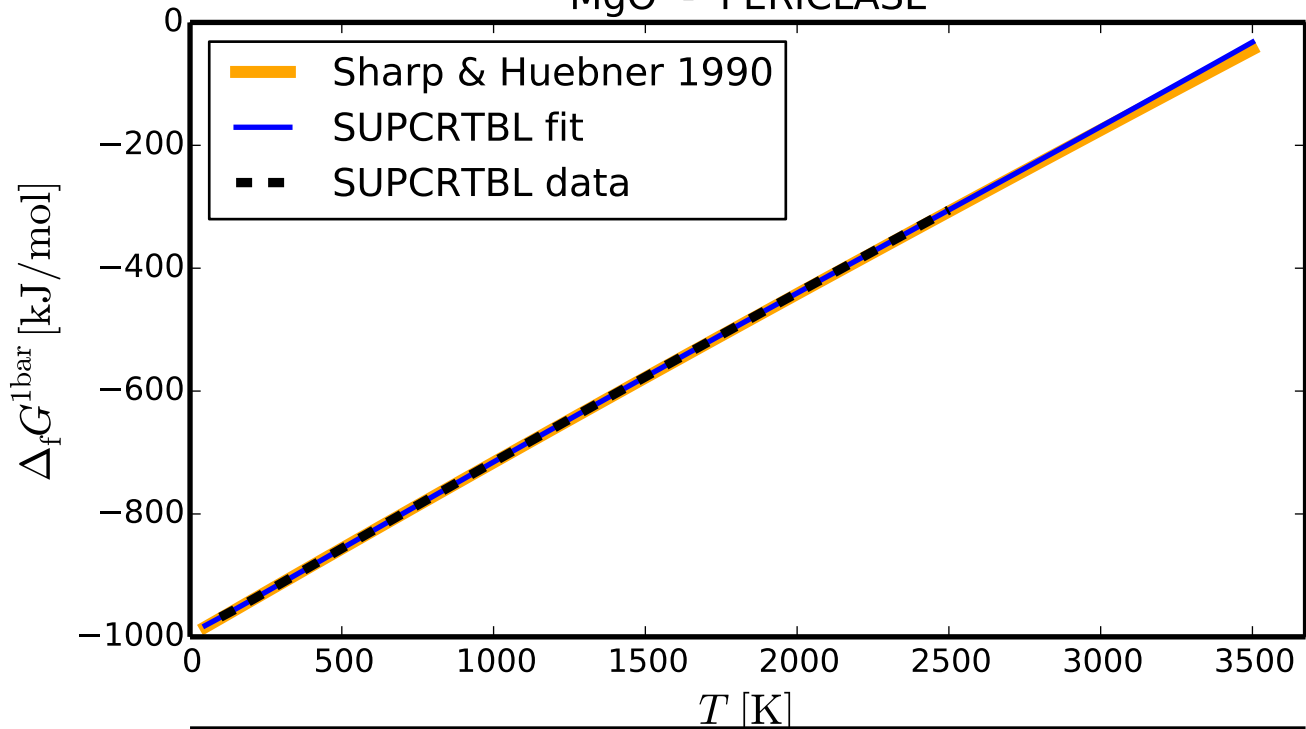


SiO₂ - QUARTZ

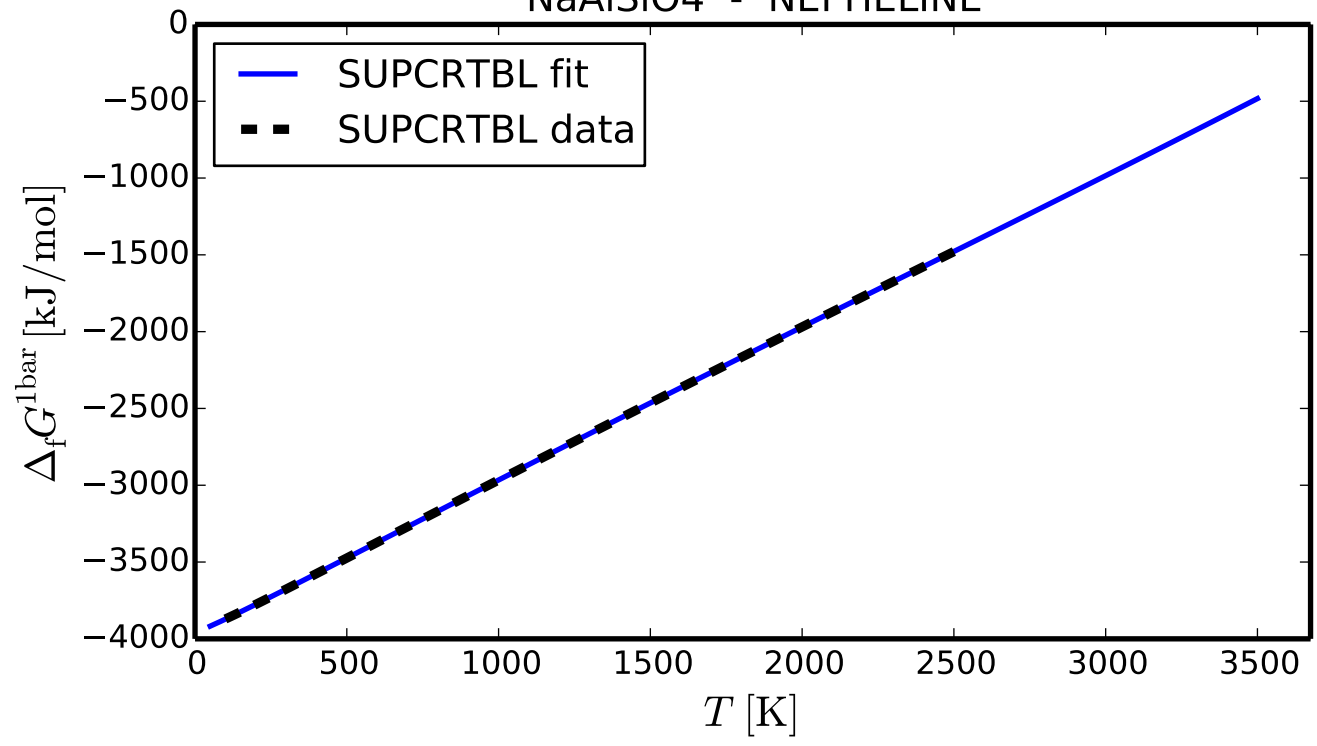
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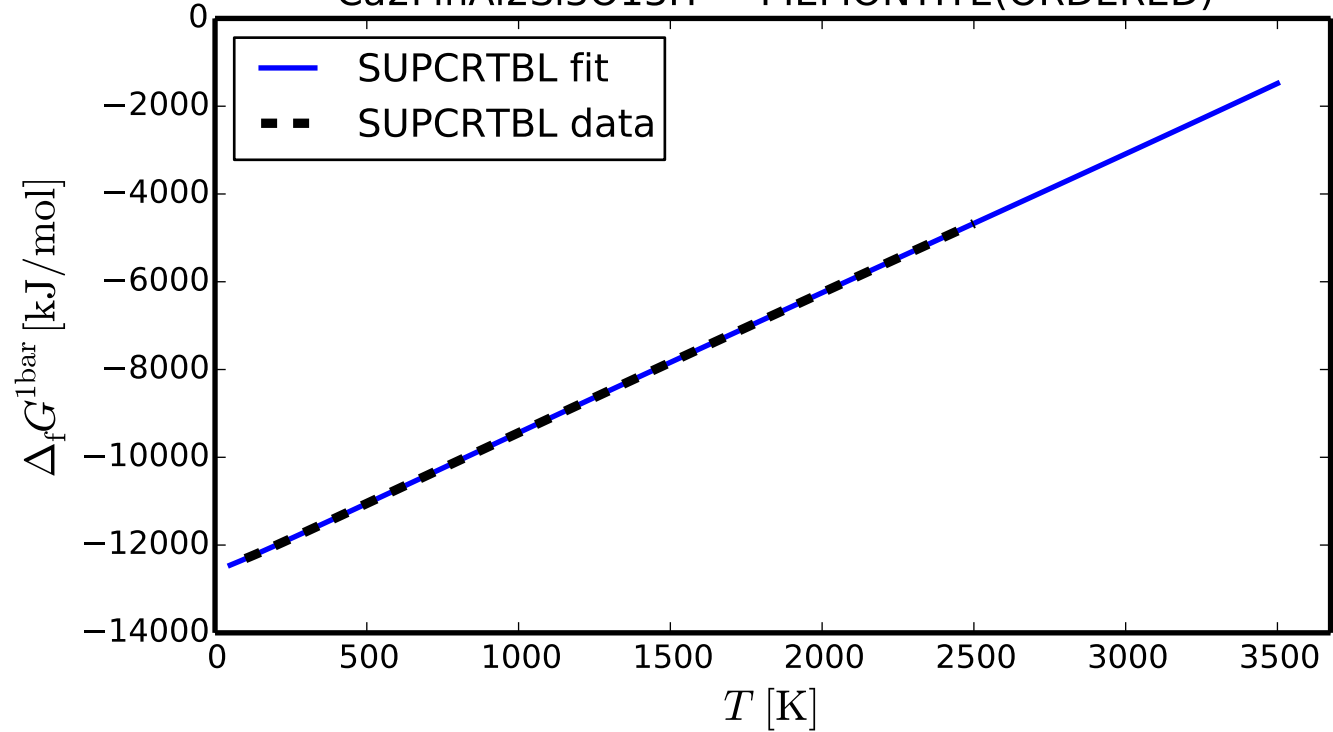
MgO - PERICLASE



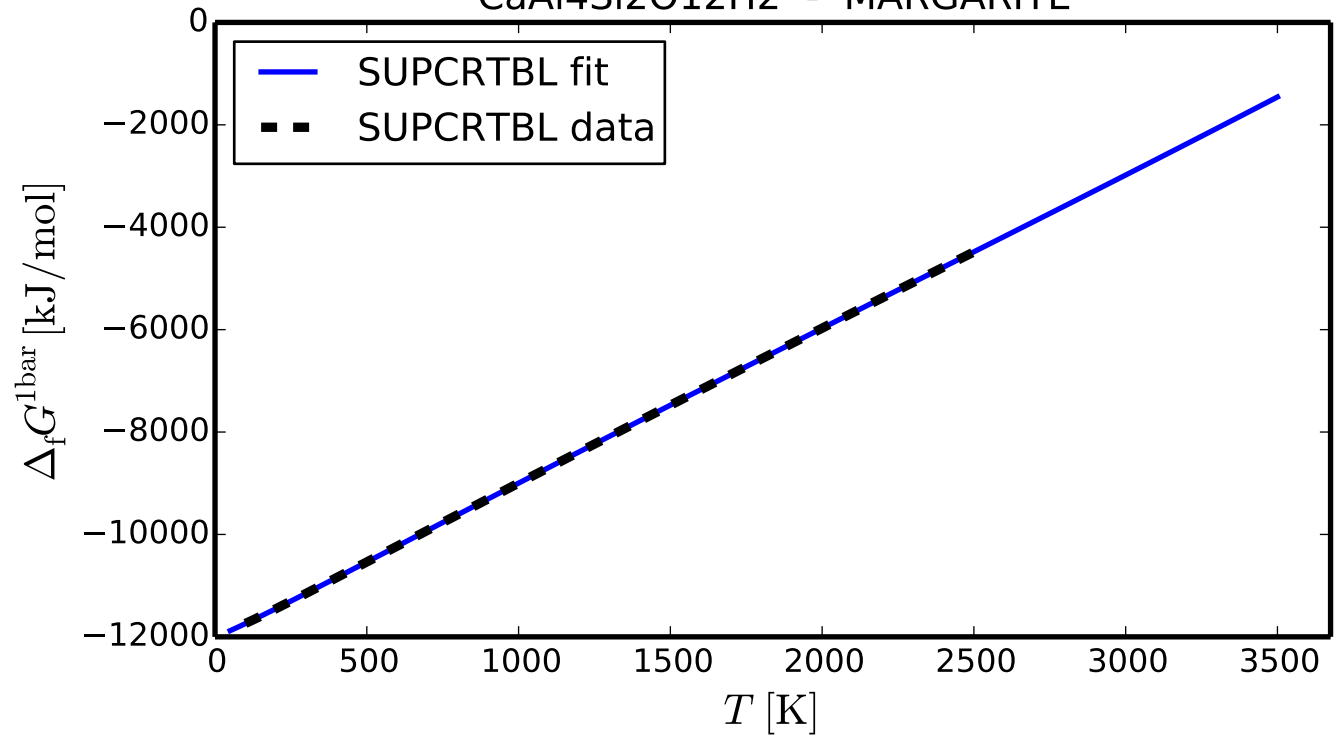
NaAlSiO₄ - NEPHELINE



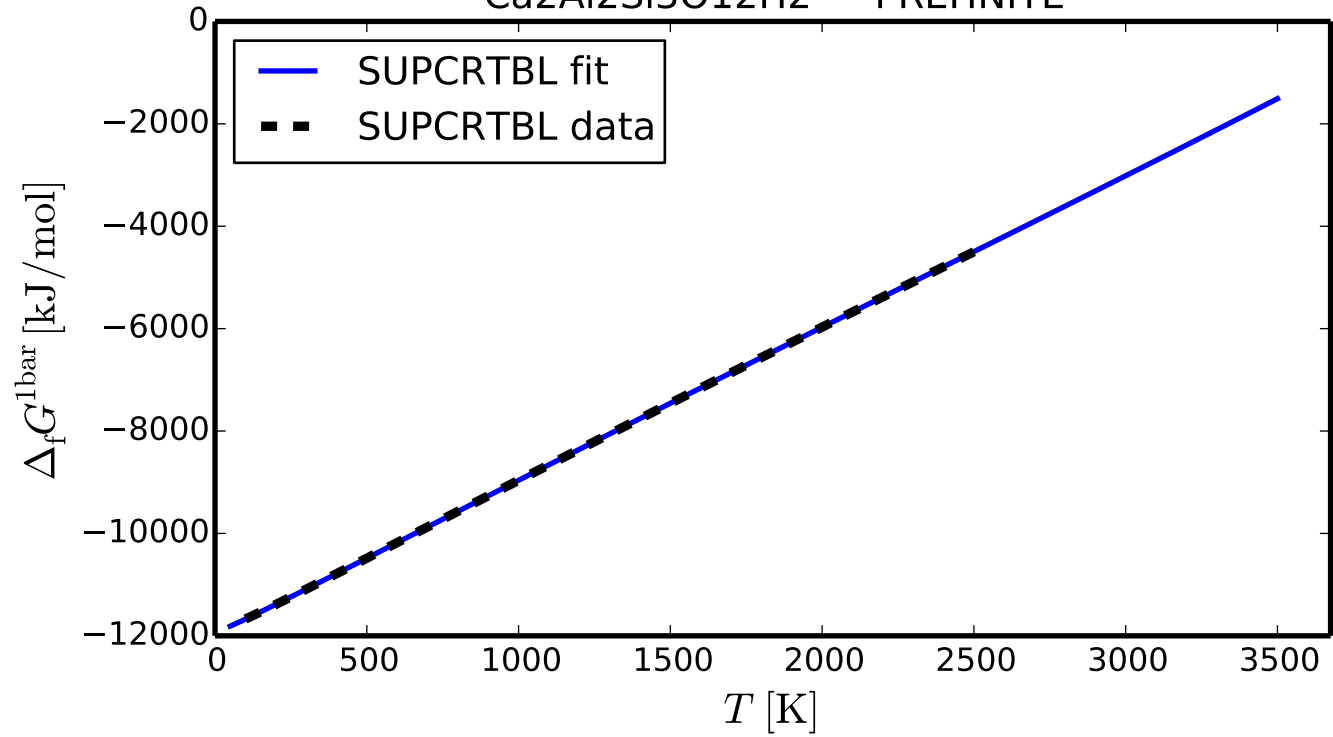
Ca2MnAl2Si3O13H - PIEMONTITE(ORDERED)

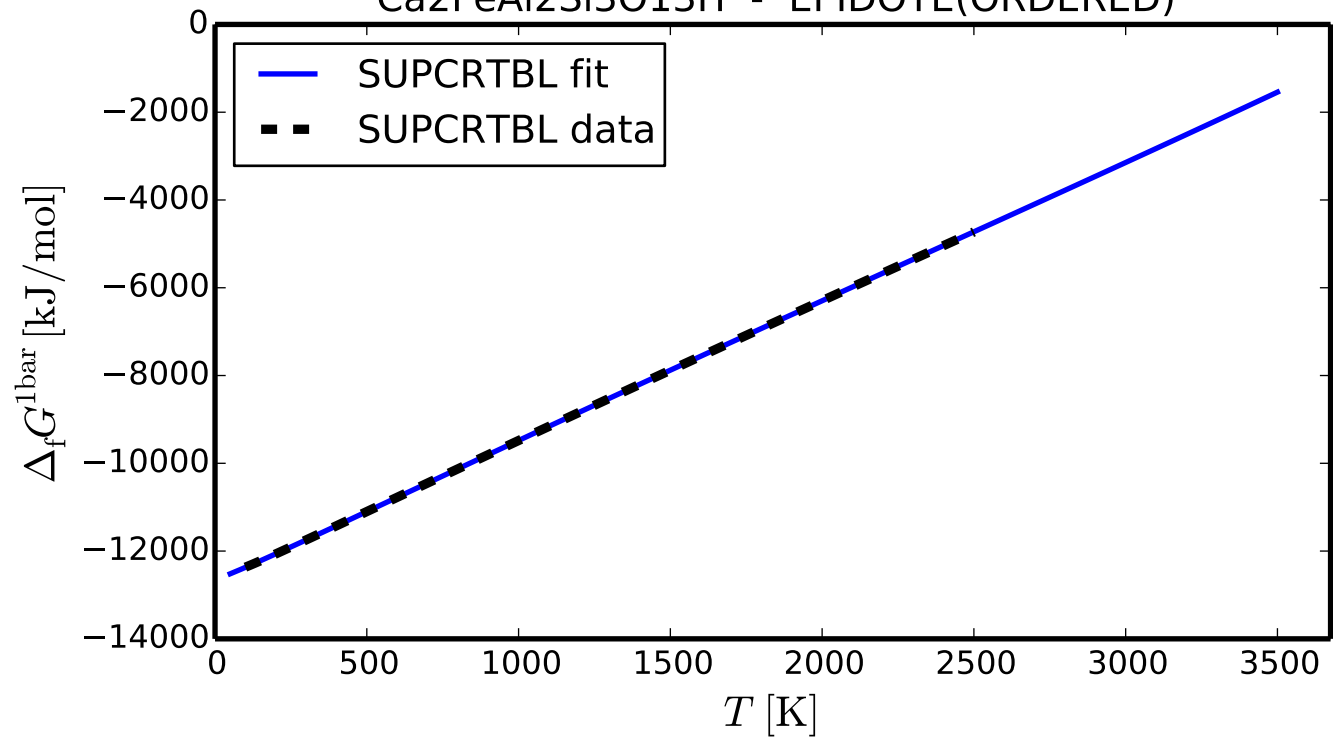


CaAl4Si2O12H2 - MARGARITE

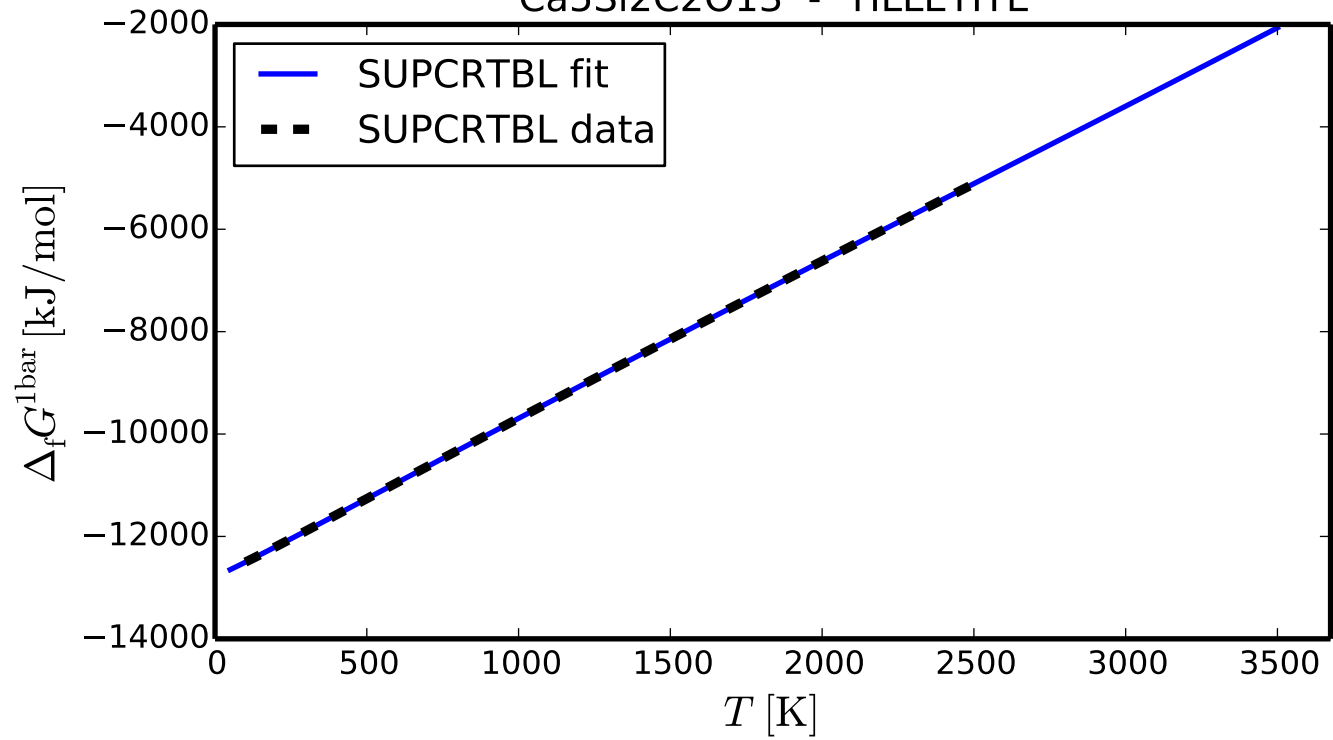


Ca2Al2Si3O12H2 - PREHNITE

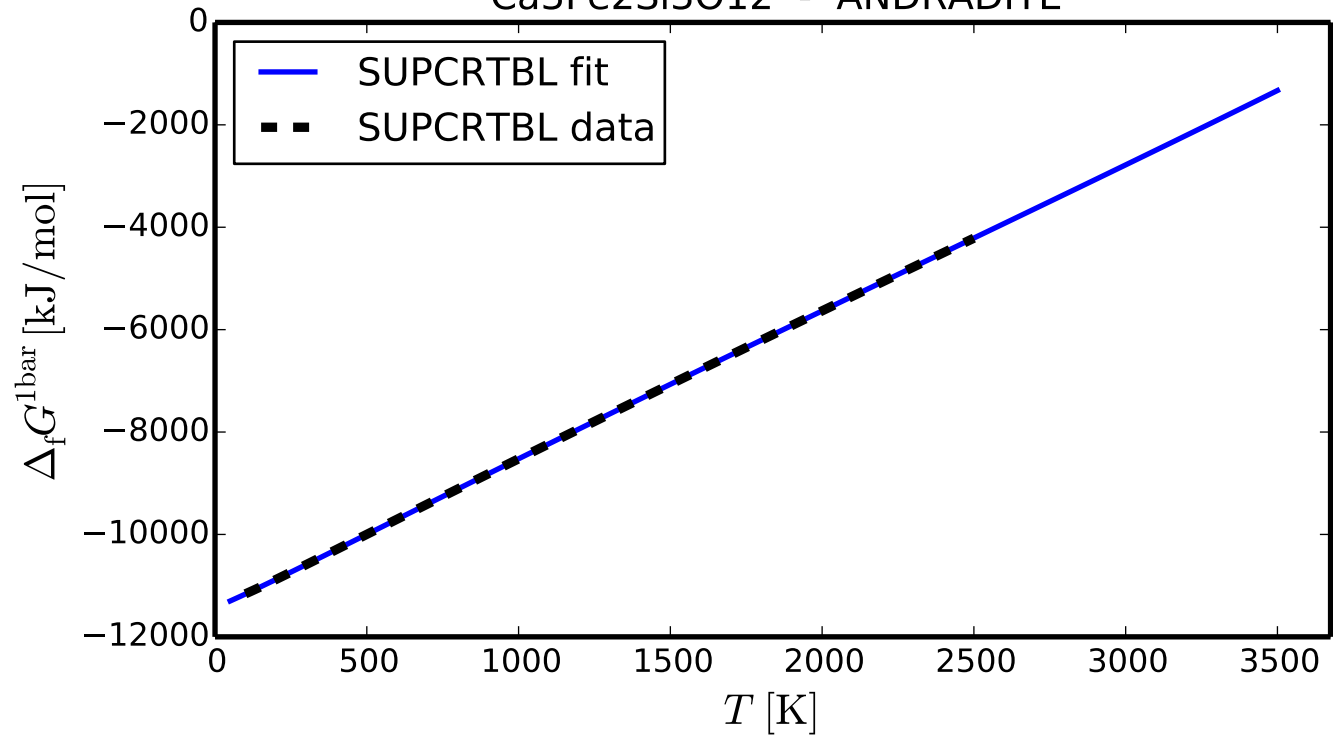


Ca₂FeAl₂Si₃O₁₃H - EPIDOTE(ORDERED)

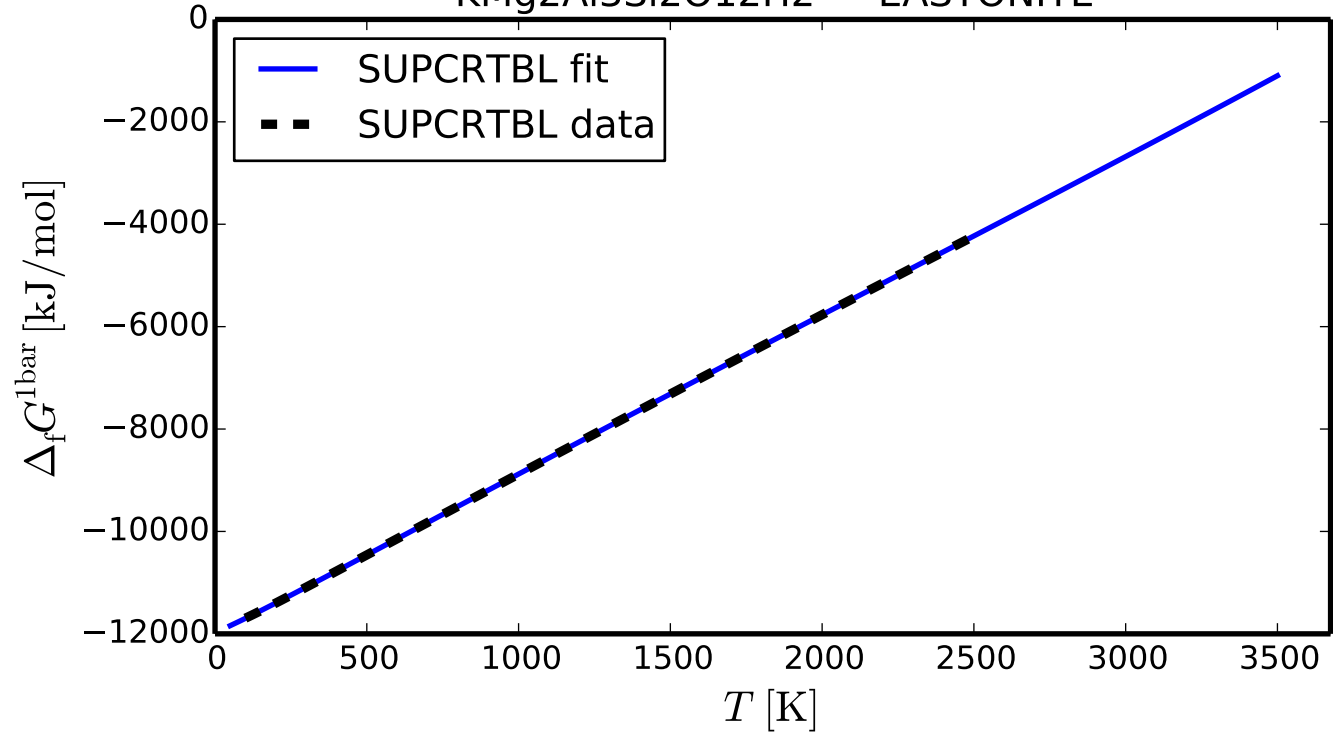
Ca5Si2C2O13 - TILLEYITE



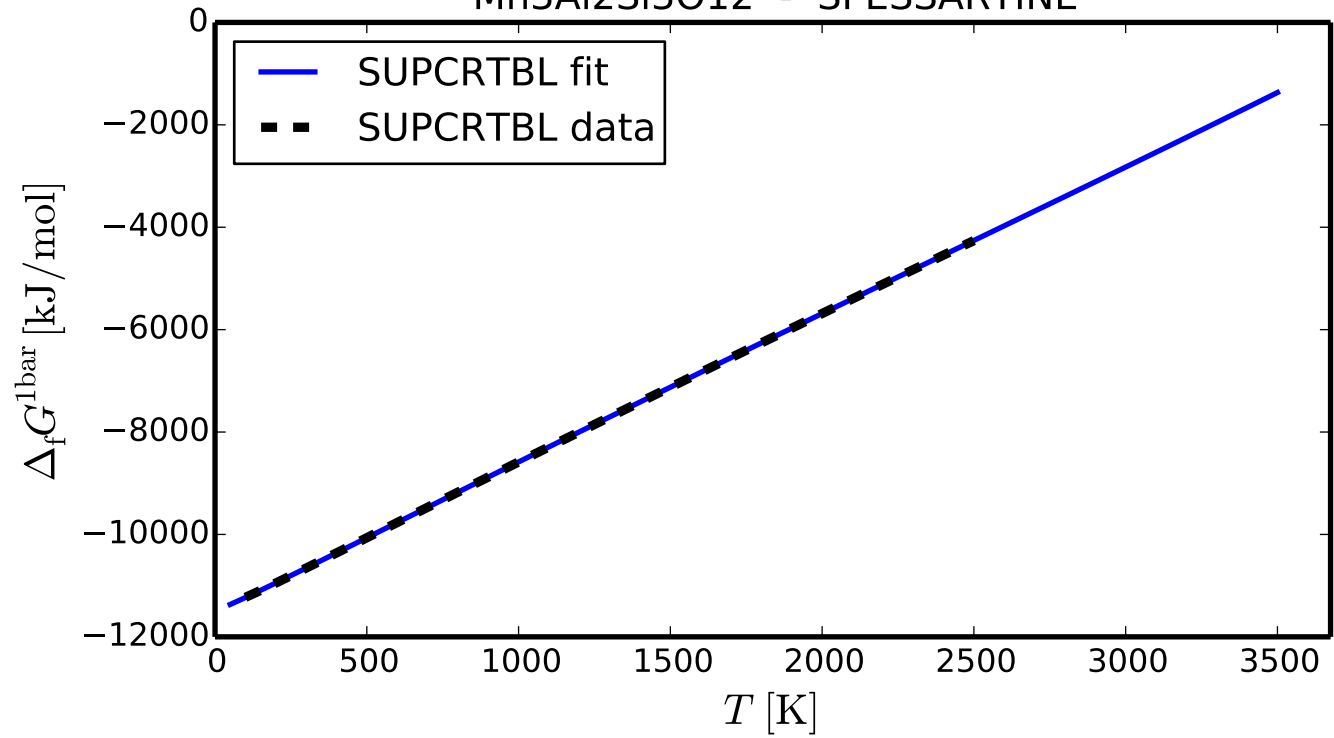
Ca3Fe2Si3O12 - ANDRADITE



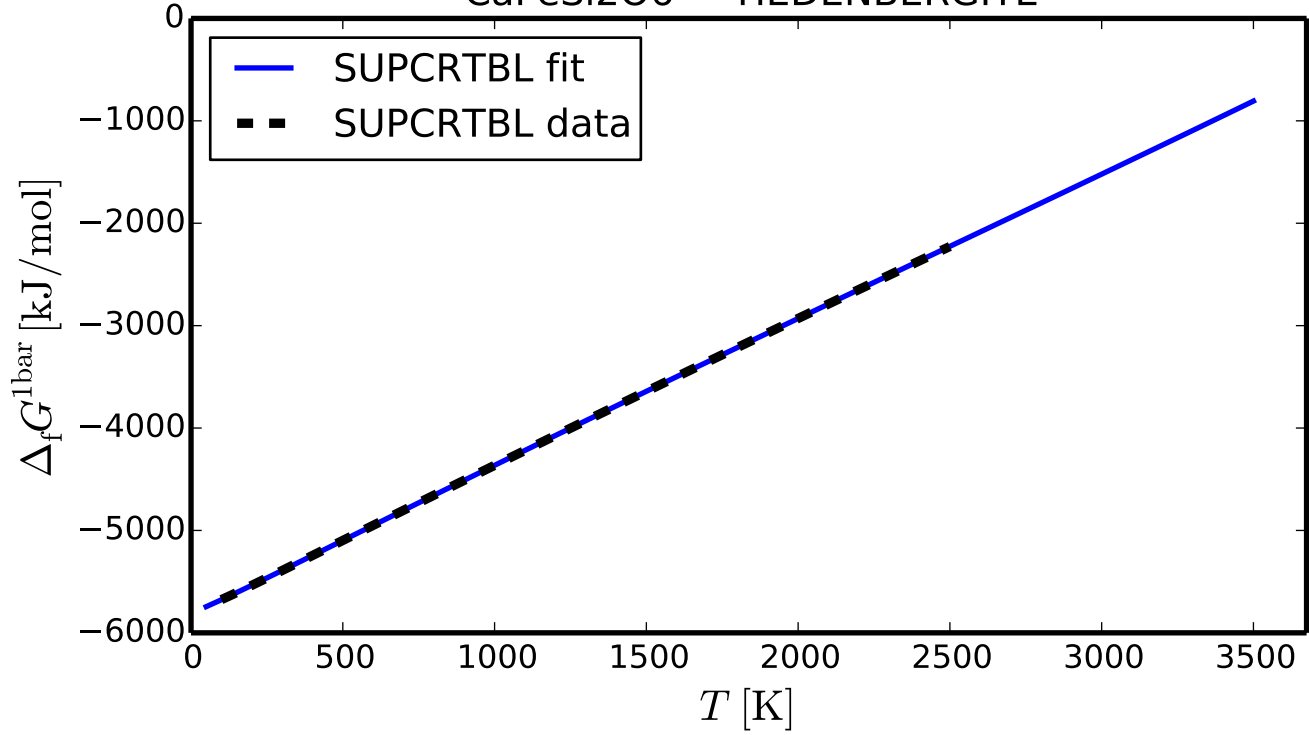
KMg2Al3Si2O12H2 - EASTONITE



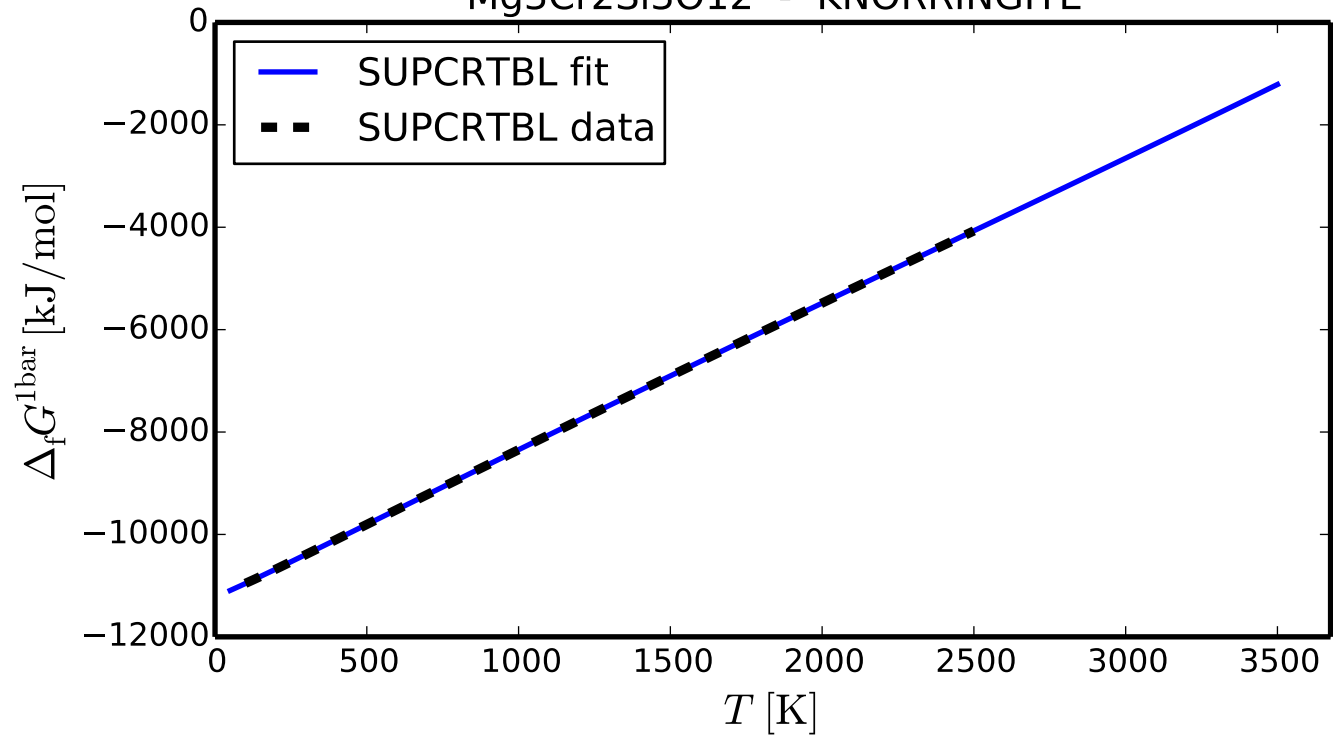
Mn3Al2Si3O12 - SPESSARTINE



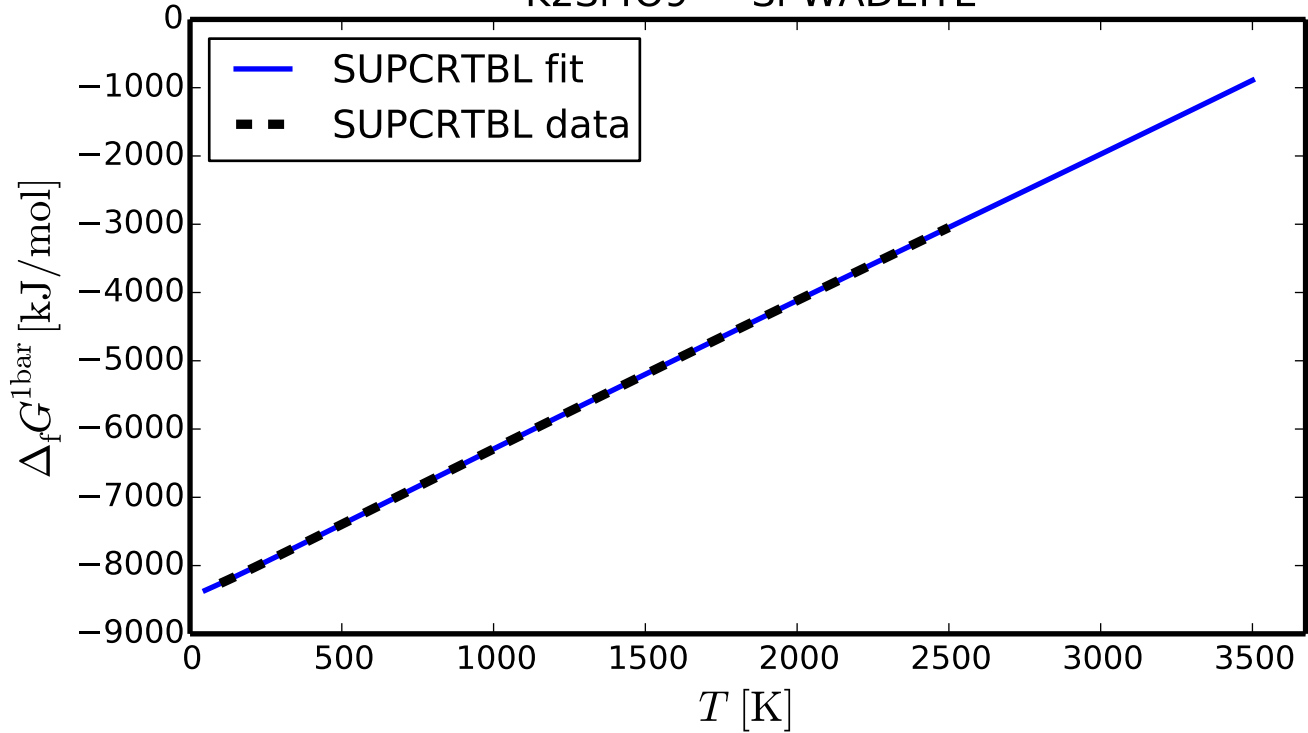
CaFeSi2O6 - HEDENBERGITE



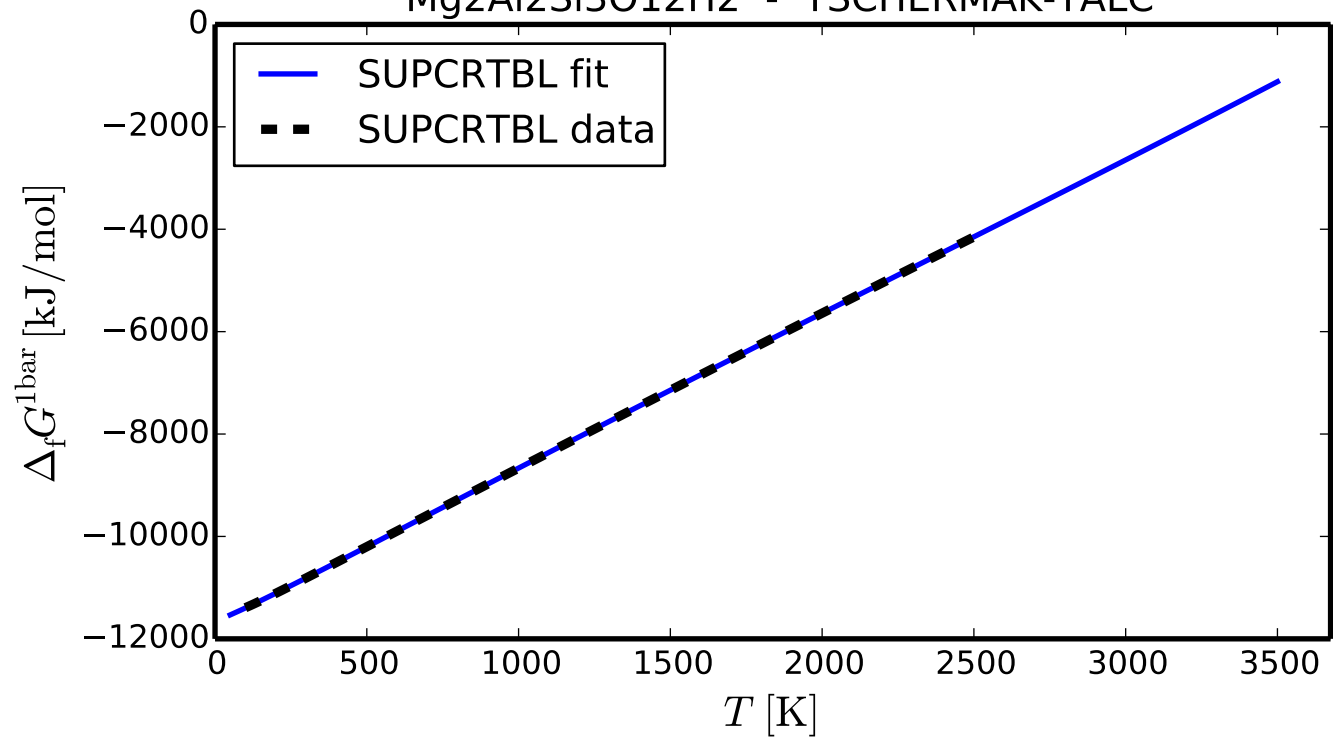
Mg3Cr2Si3O12 - KNORRINGITE



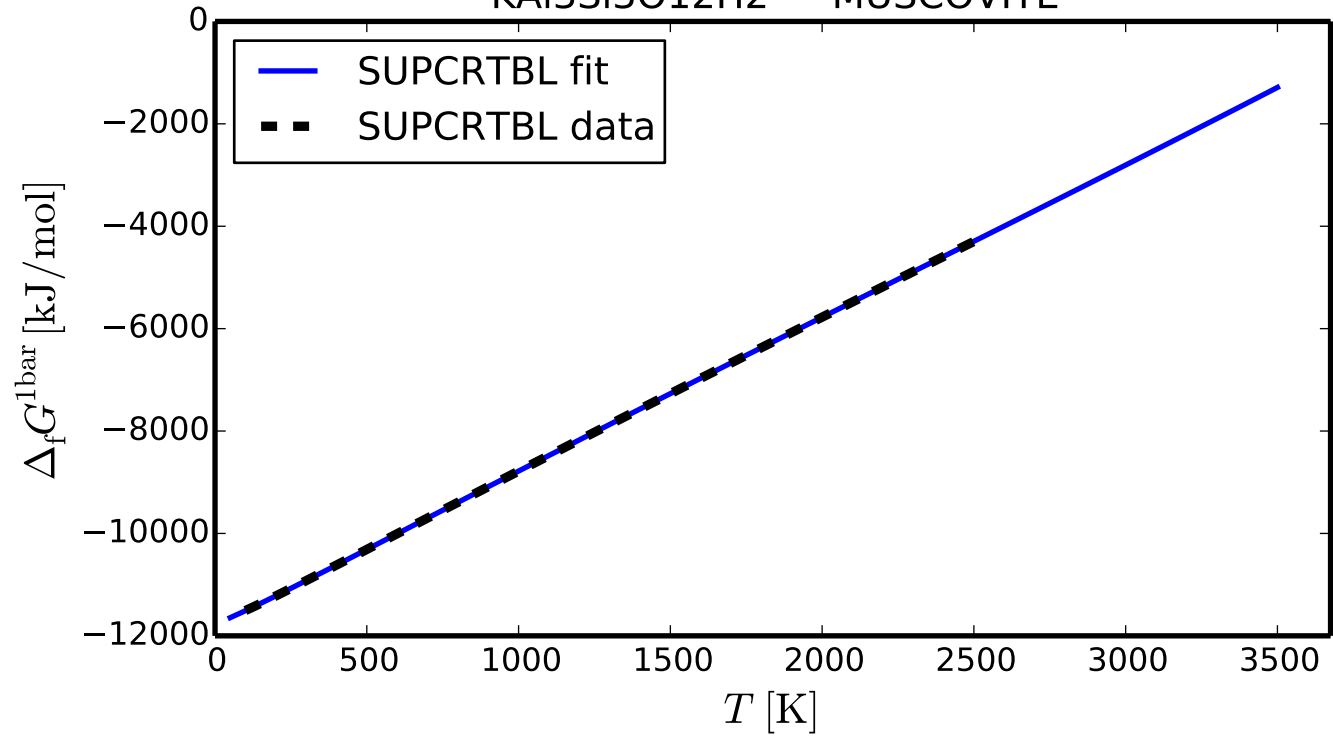
K2Si4O9 - Si-WADEITE



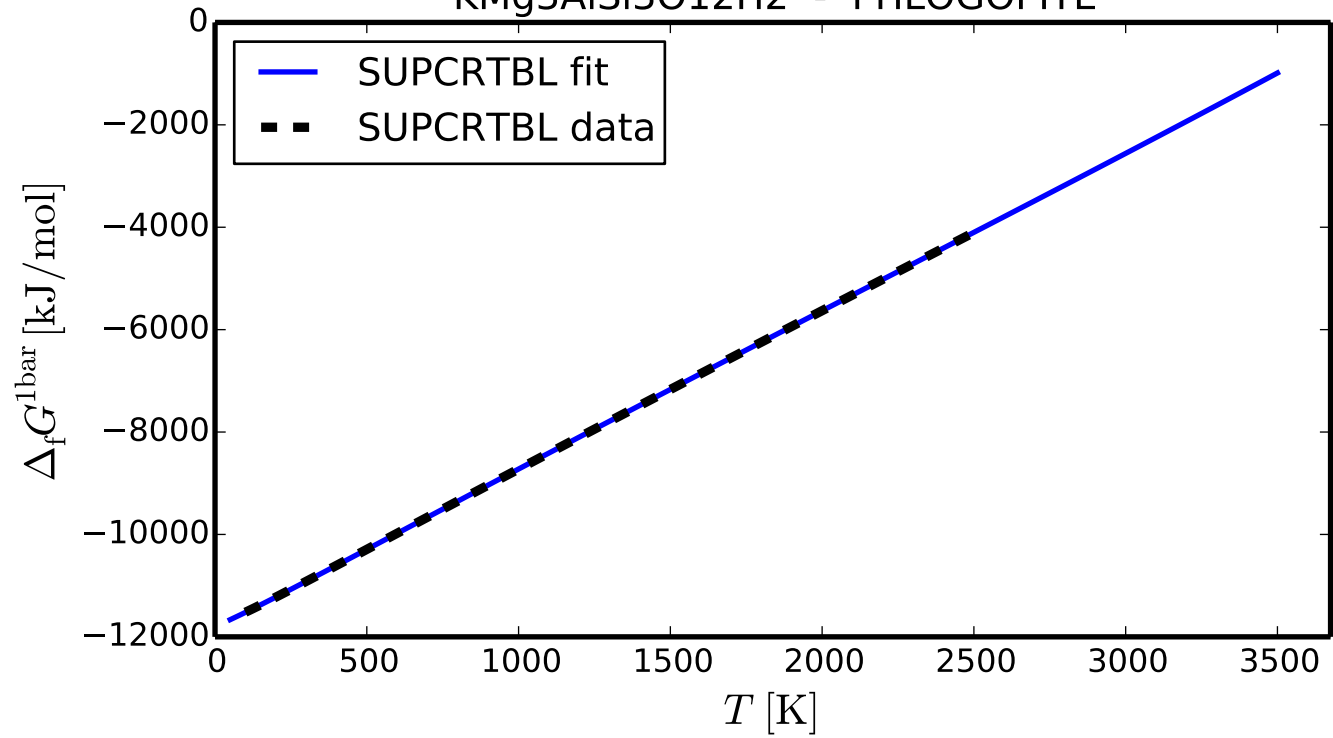
Mg₂Al₂Si₃O₁₂H₂ - TSCHERMAK-TALC



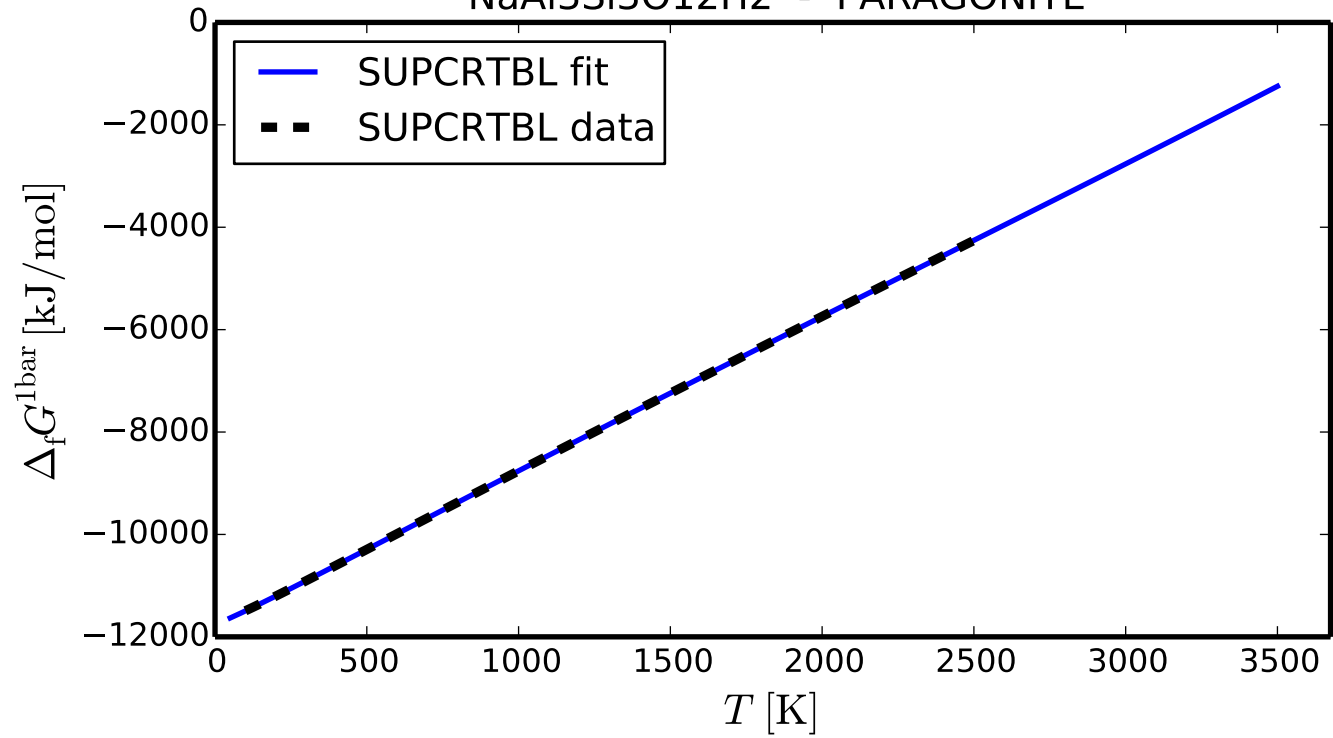
KAl3Si3O12H2 - MUSCOVITE



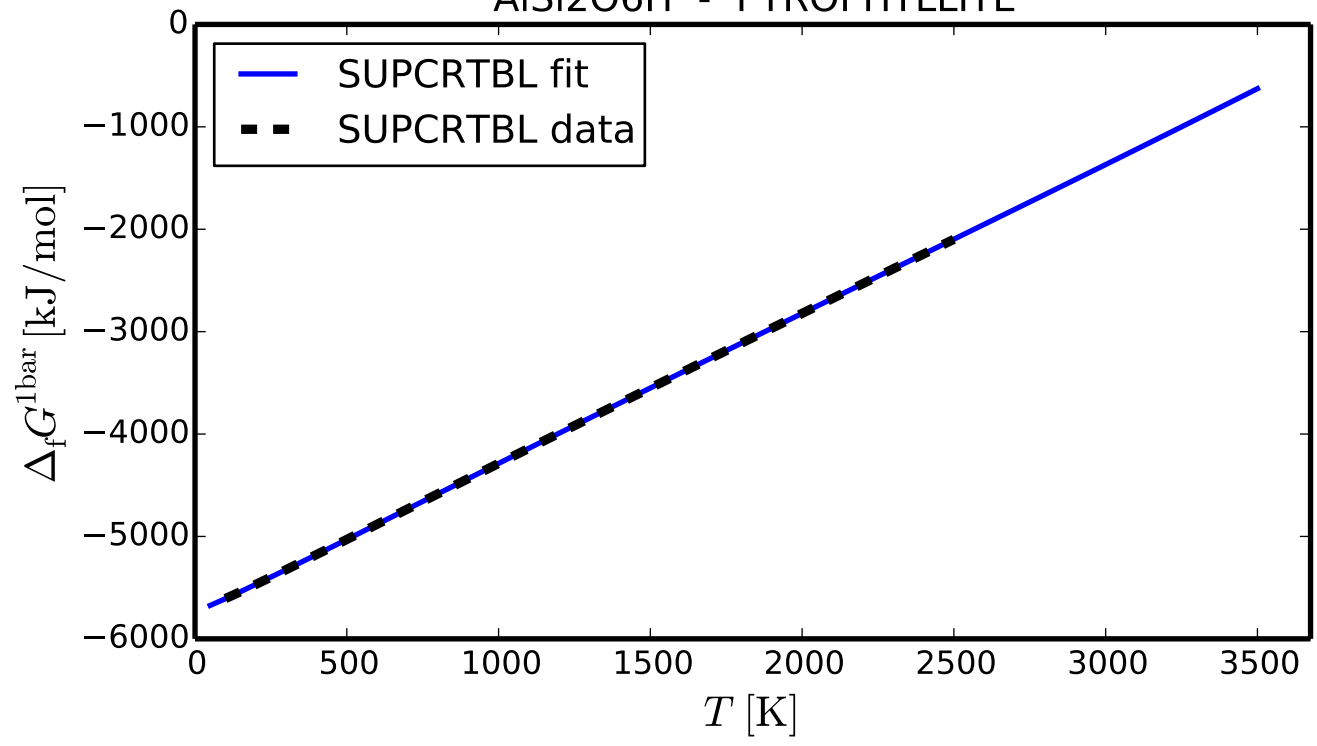
KMg3AlSi3O12H2 - PHLOGOPITE



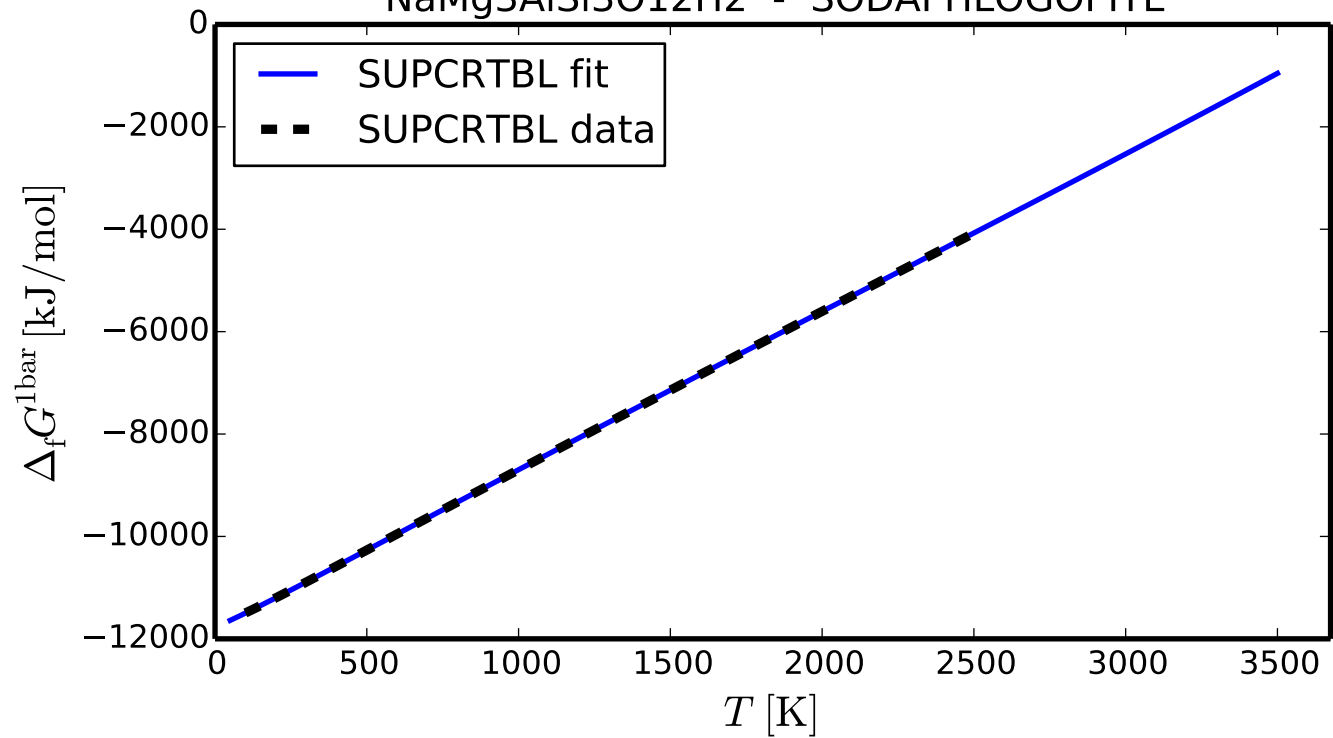
NaAl3Si3O12H2 - PARAGONITE



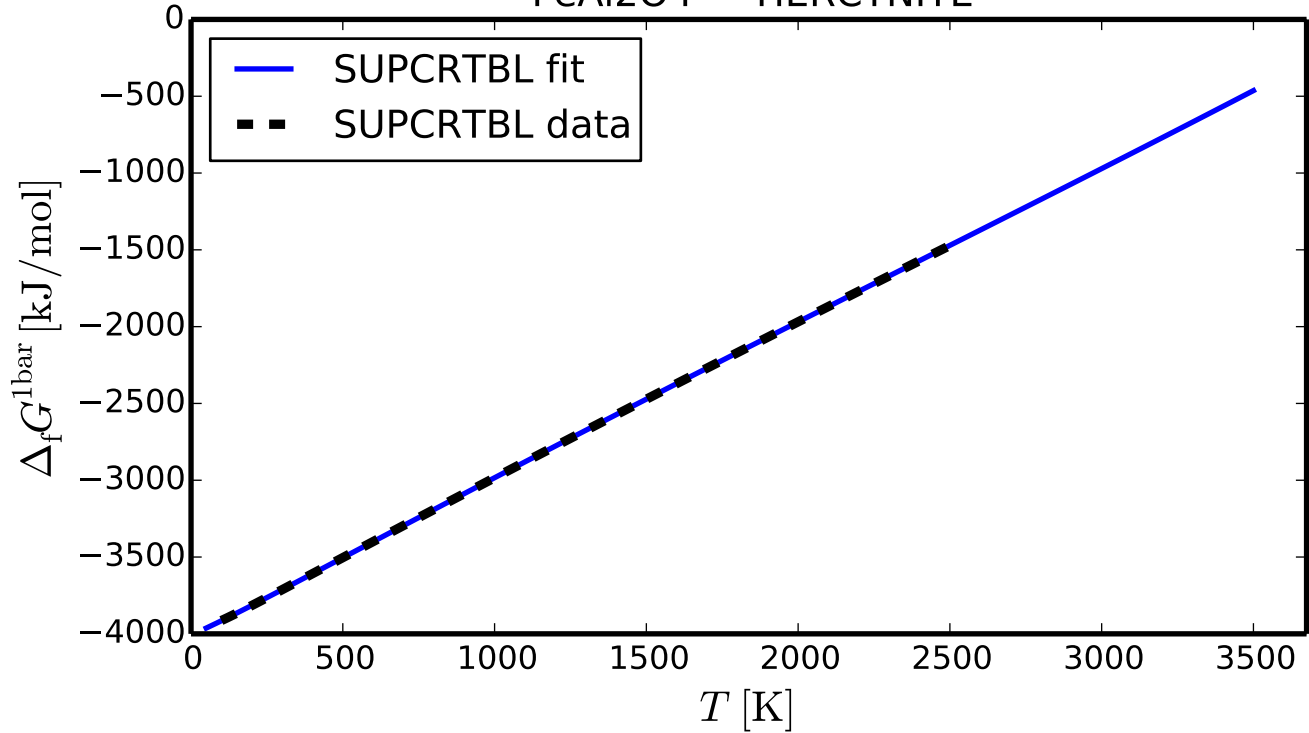
AlSi2O6H - PYROPHYLLITE



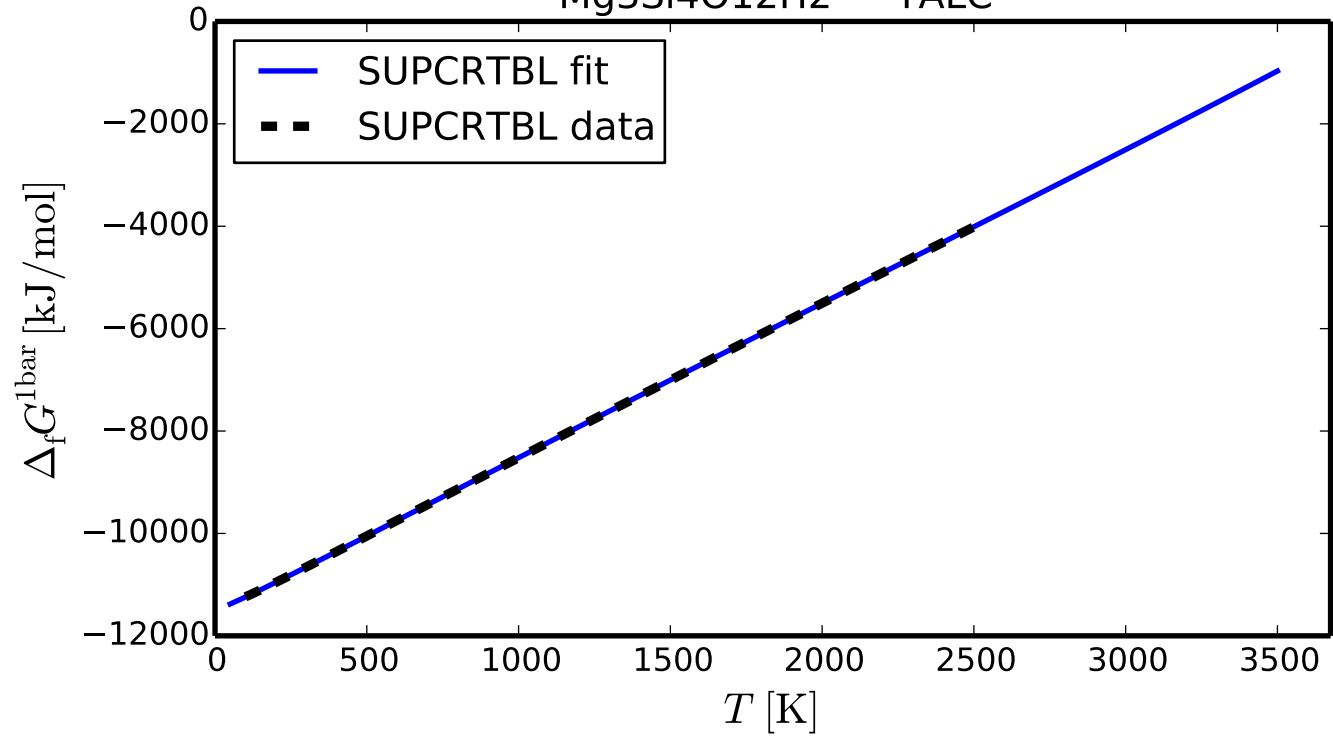
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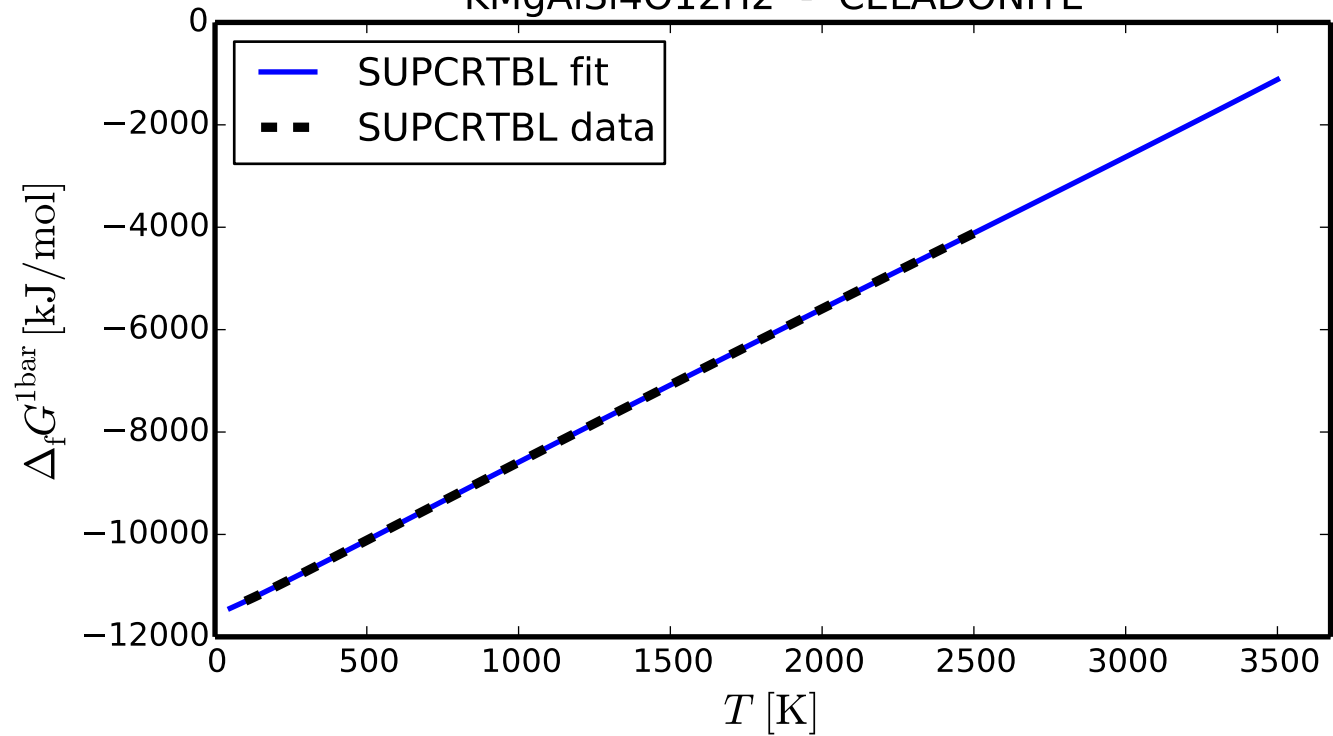
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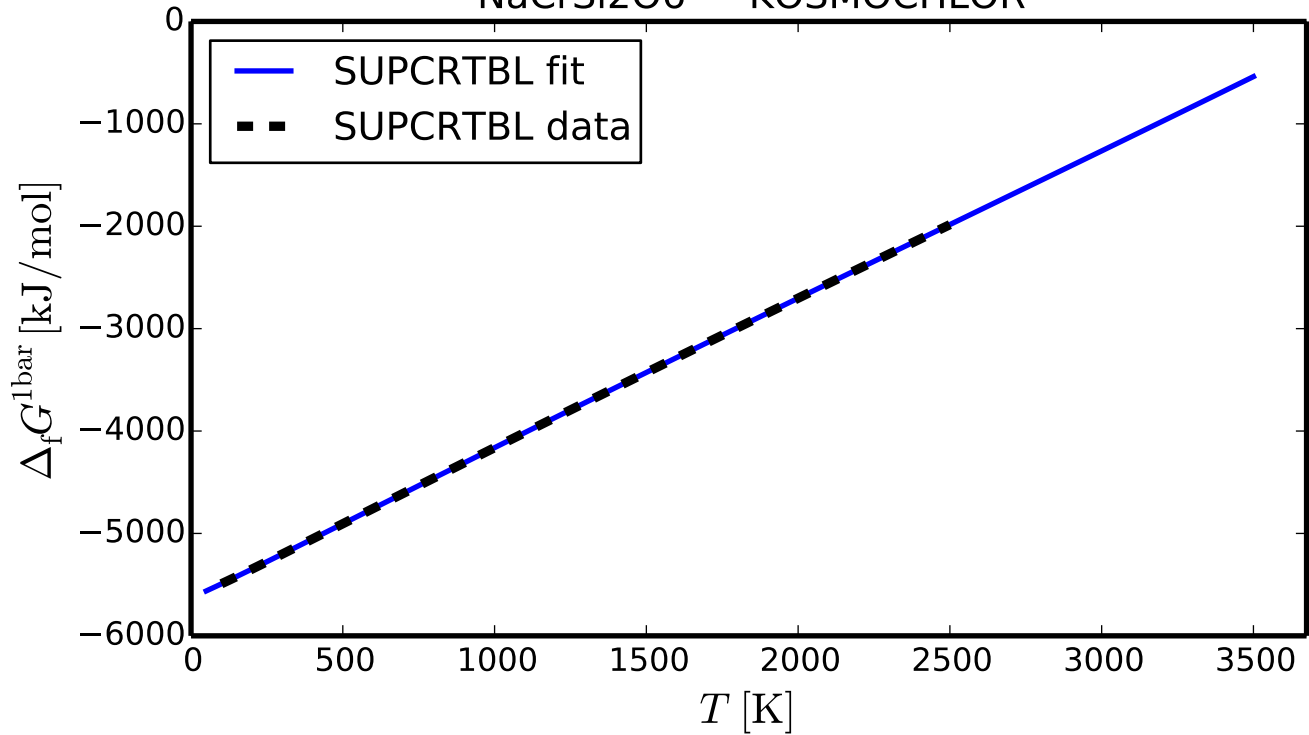
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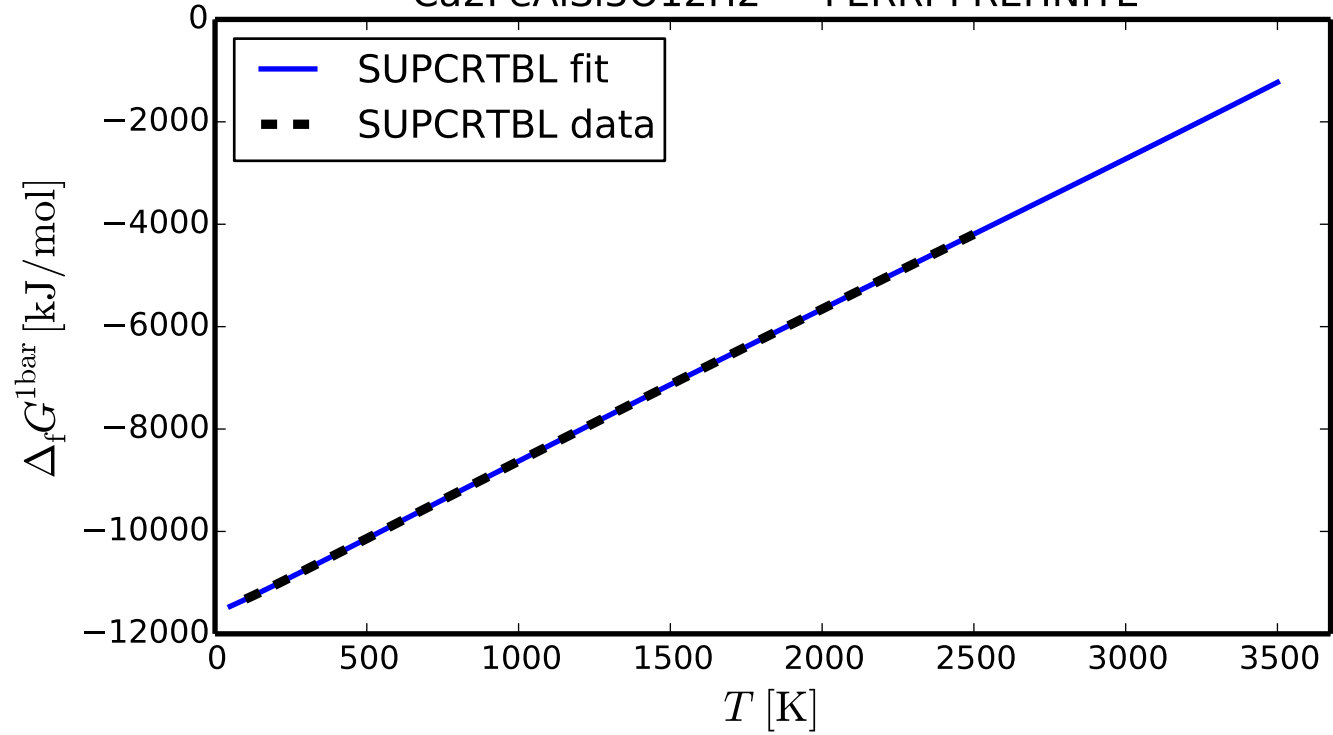
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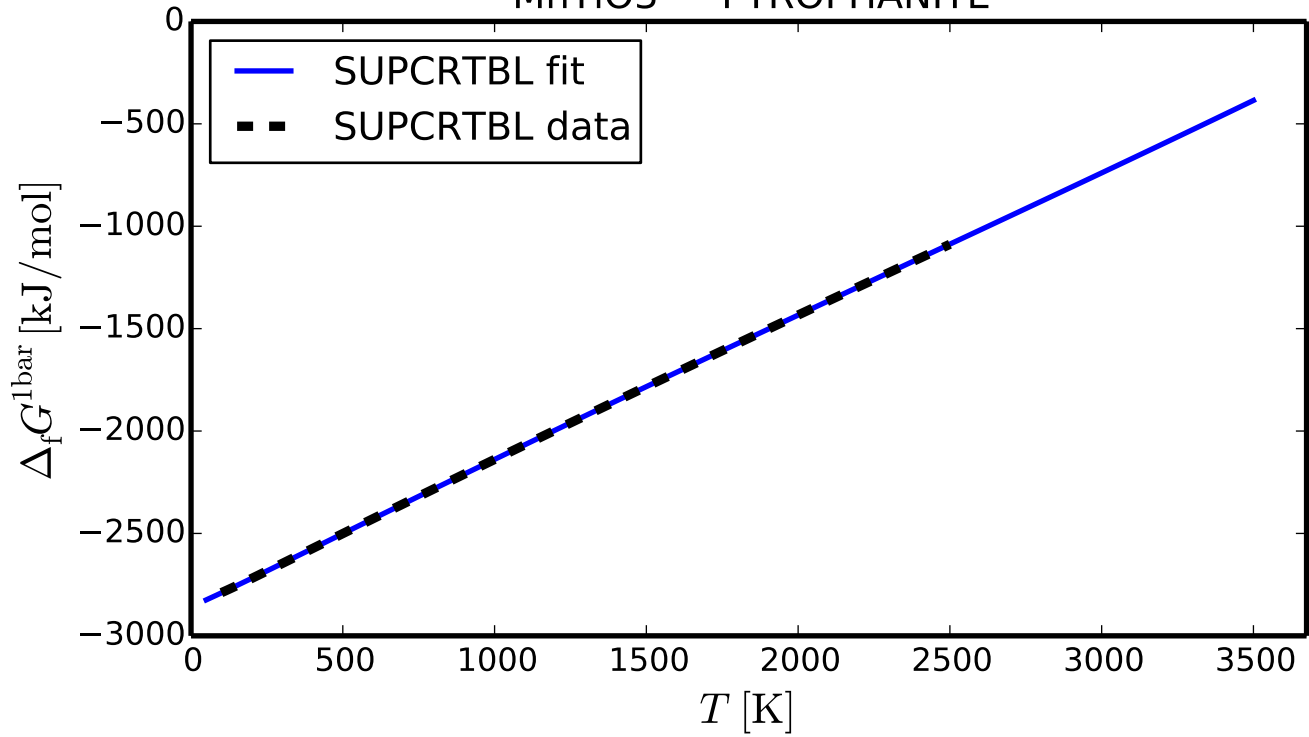
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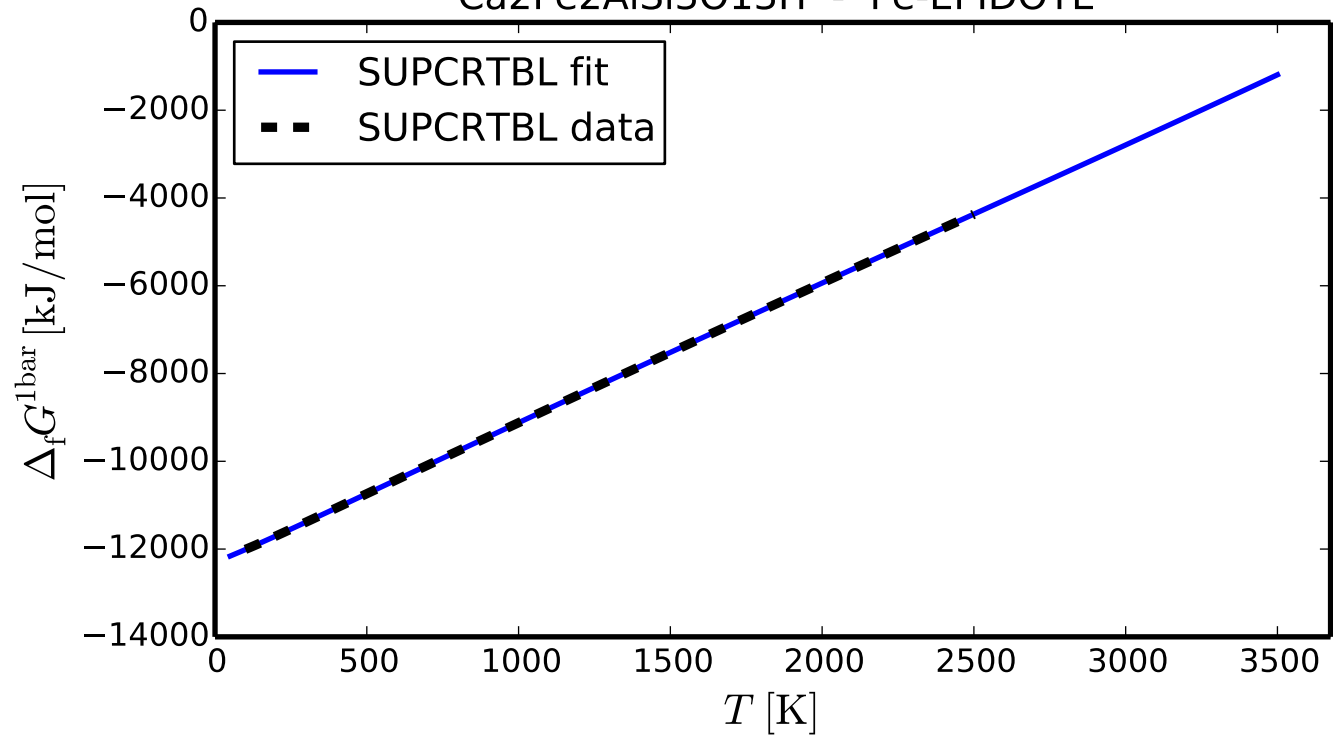
Ca2FeAlSi3O12H2 - FERRI-PREHNITE



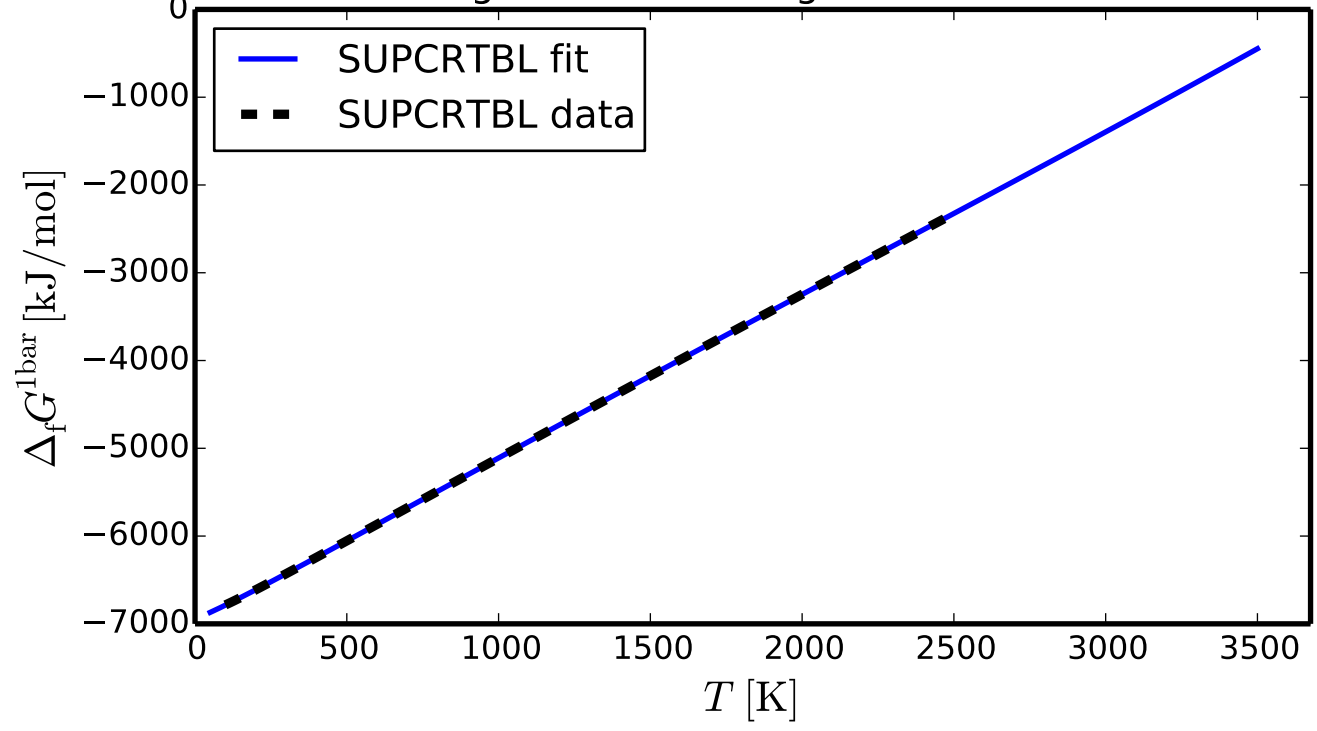
MnTiO3 - PYROPHANITE



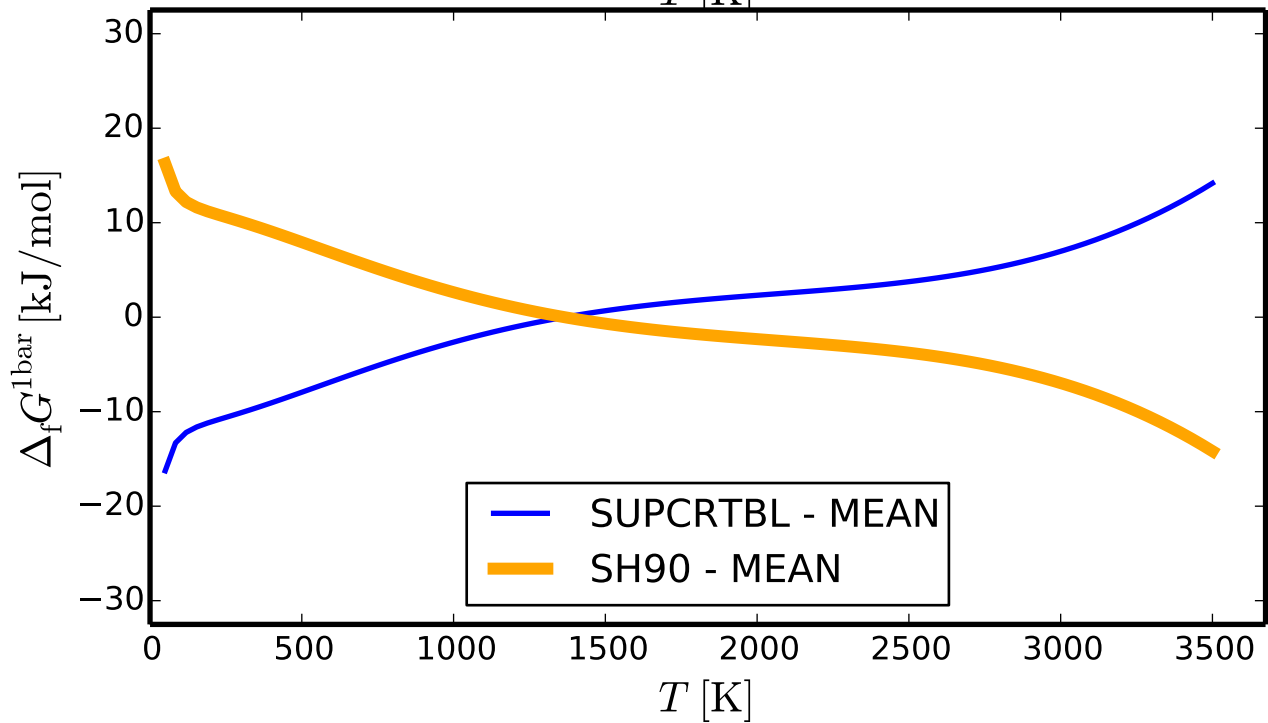
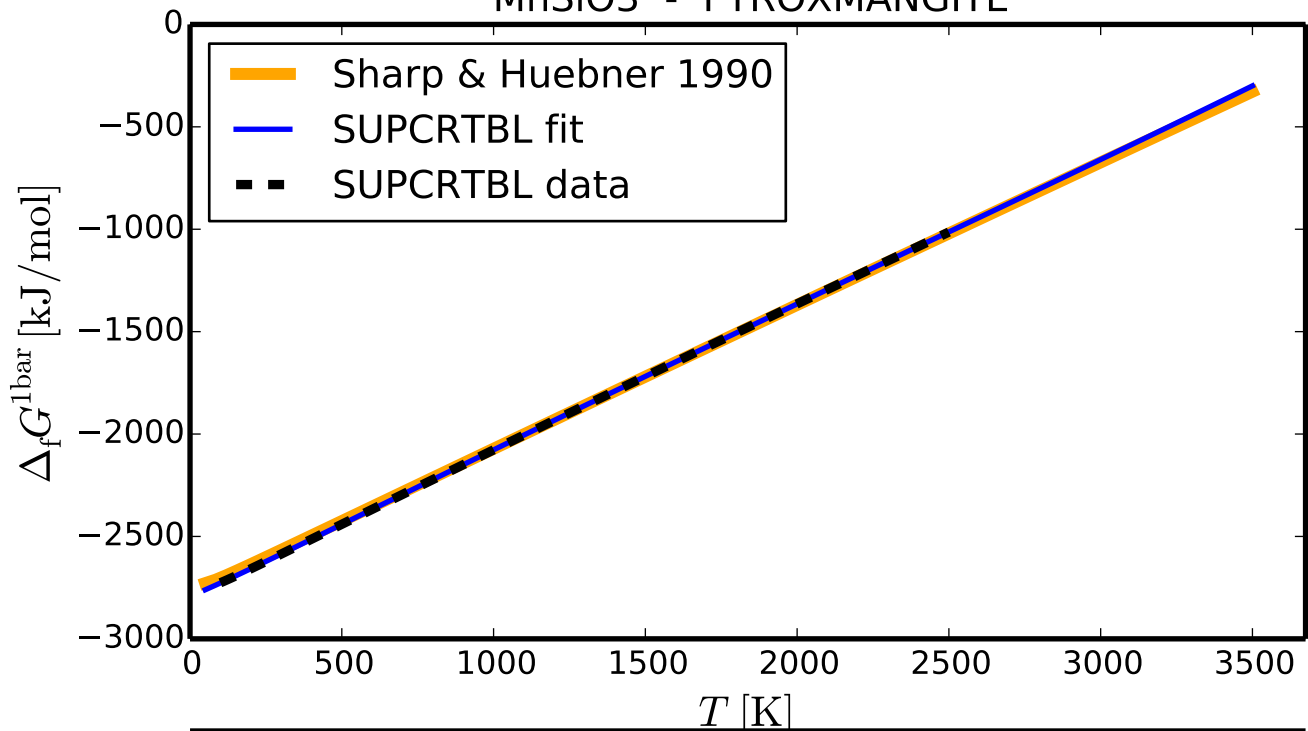
Ca₂Fe₂AlSi₃O₁₃H - Fe-EPIDOTE



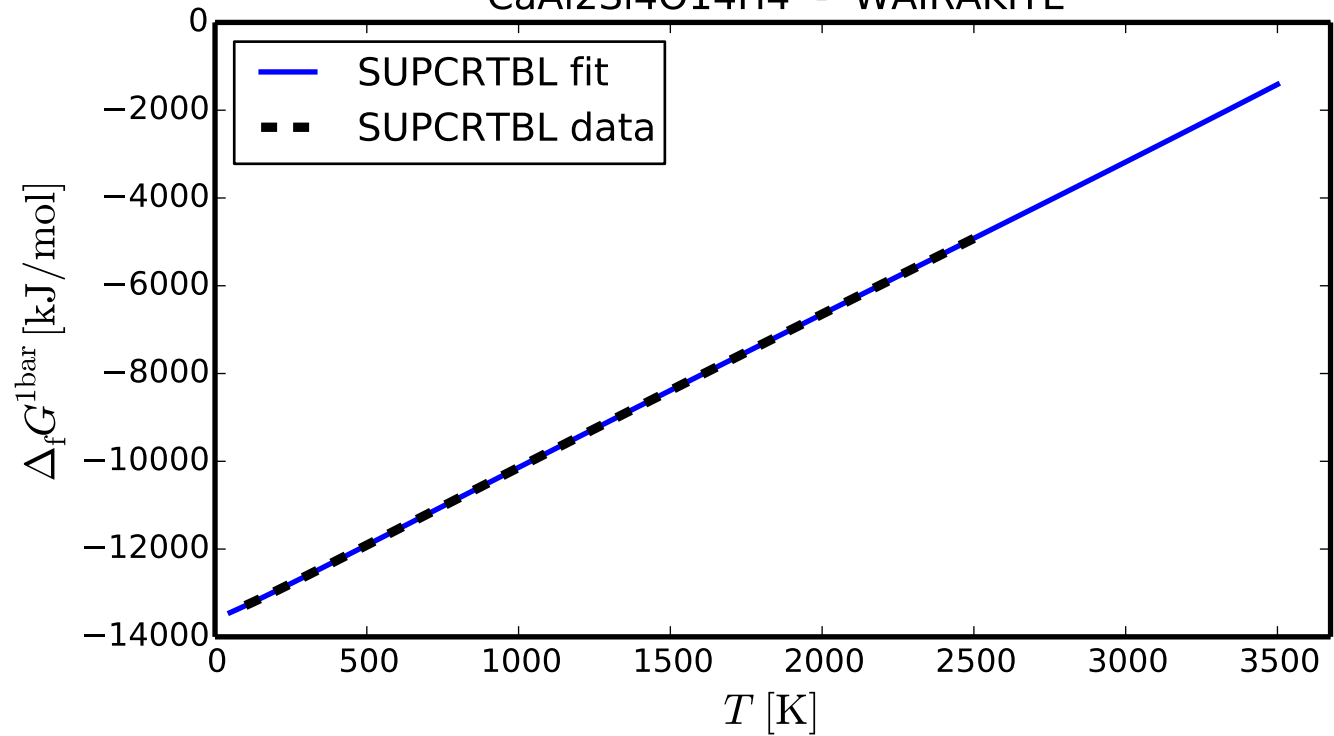
MgAl2SiO7H2 - Mg-CHLORITOID



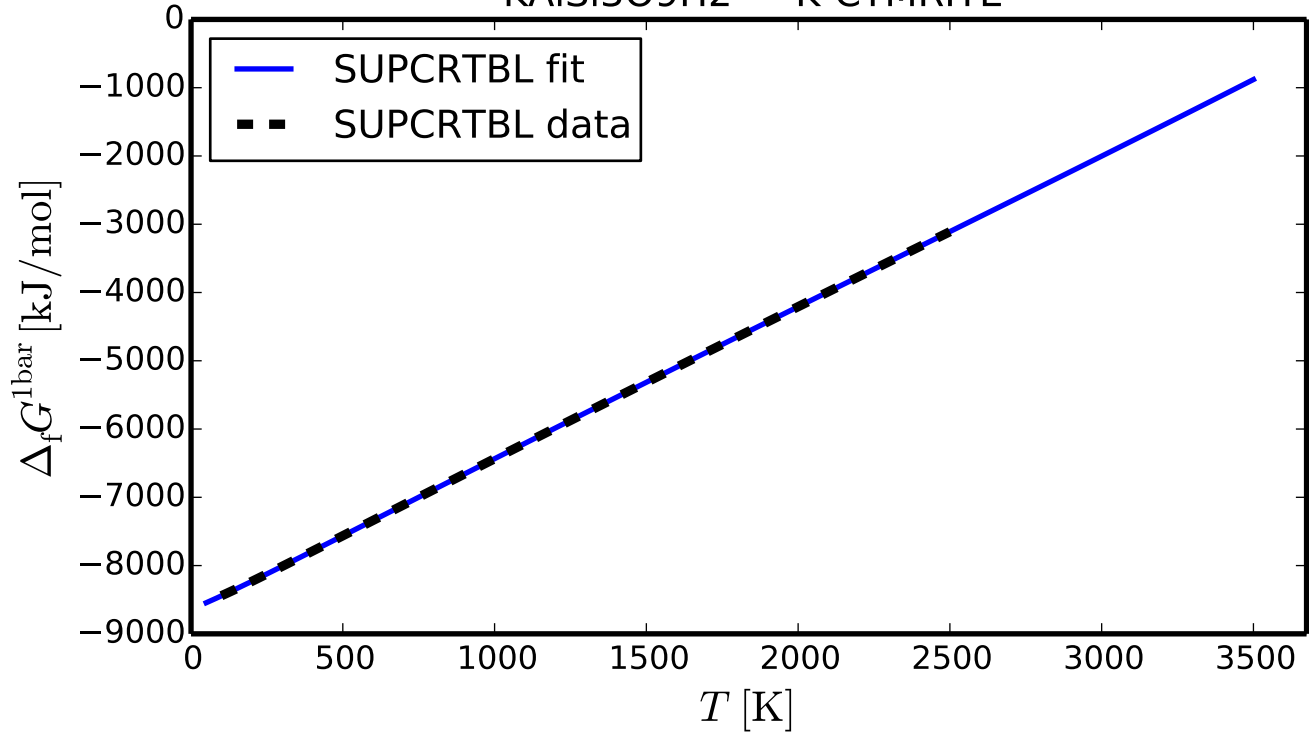
MnSiO3 - PYROXMANGITE



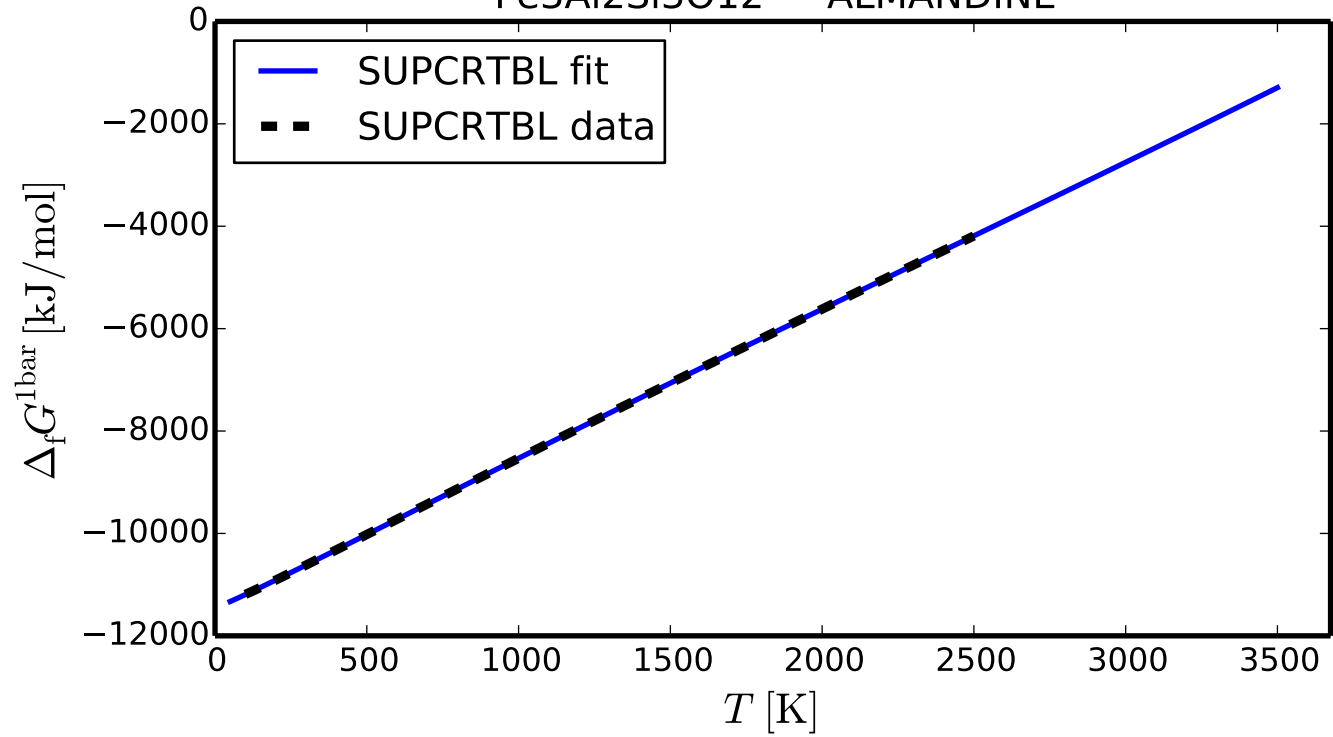
CaAl2Si4O14H4 - WAIRAKITE

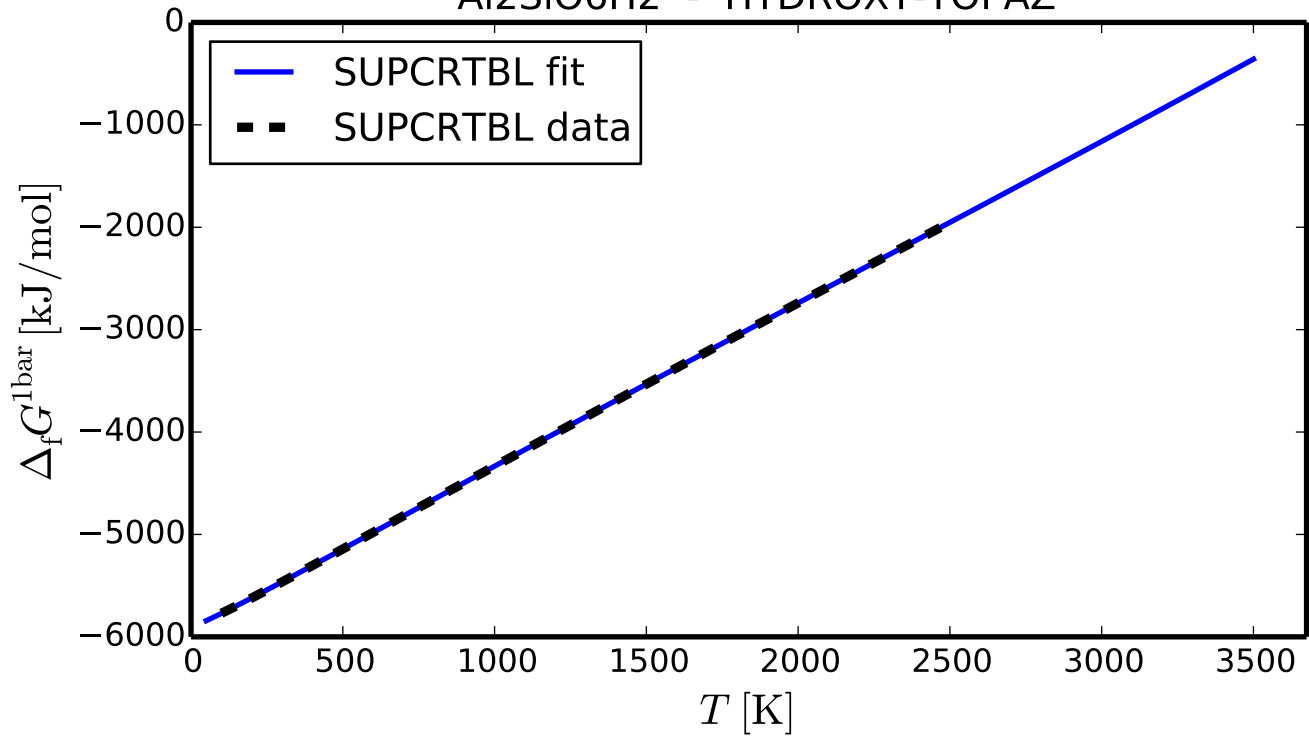


KAISI3O9H2 - K-CYMRITE

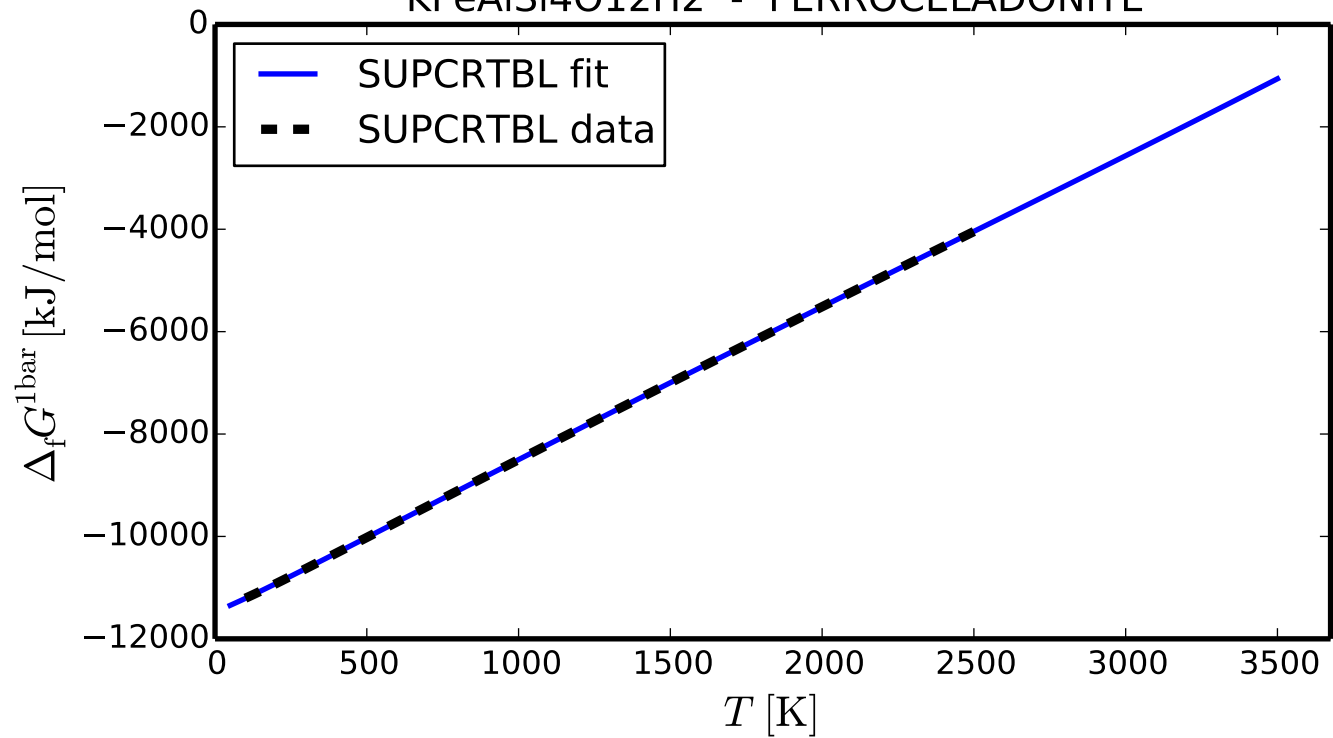


Fe3Al2Si3O12 - ALMANDINE

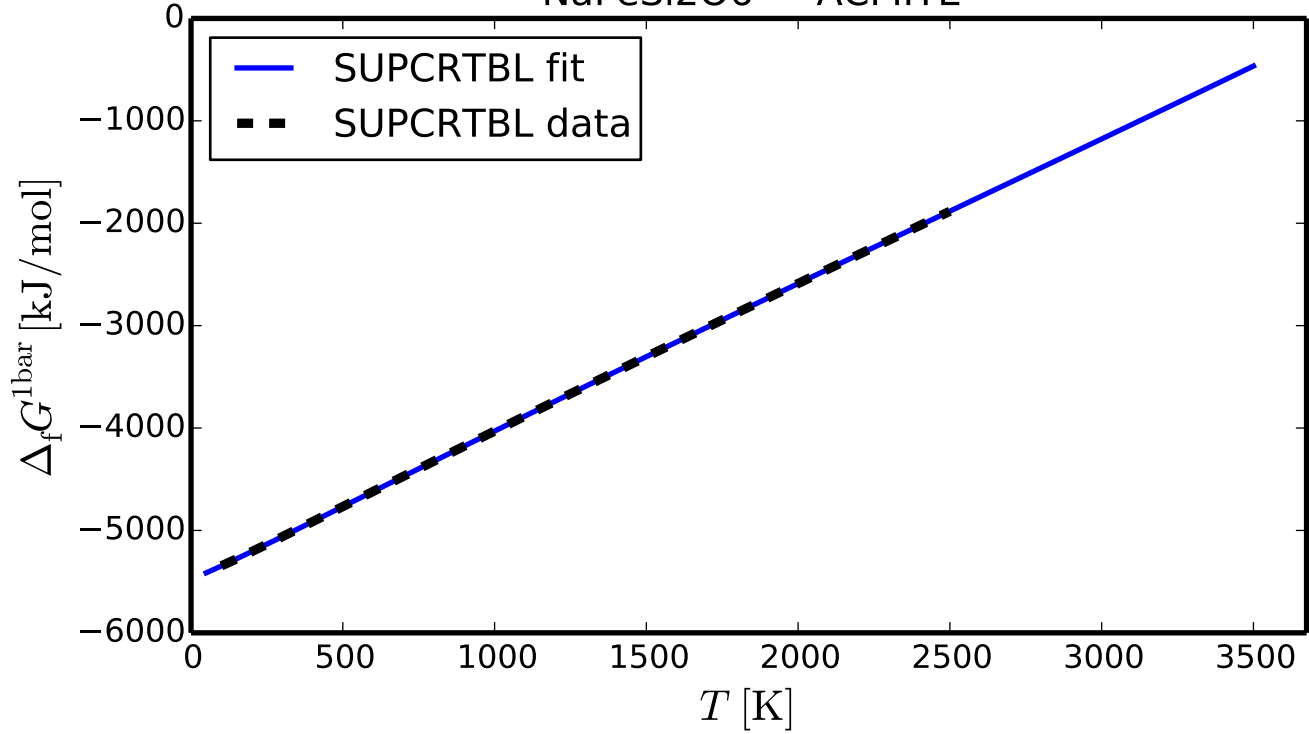


Al₂SiO₆H₂ - HYDROXY-TOPAZ

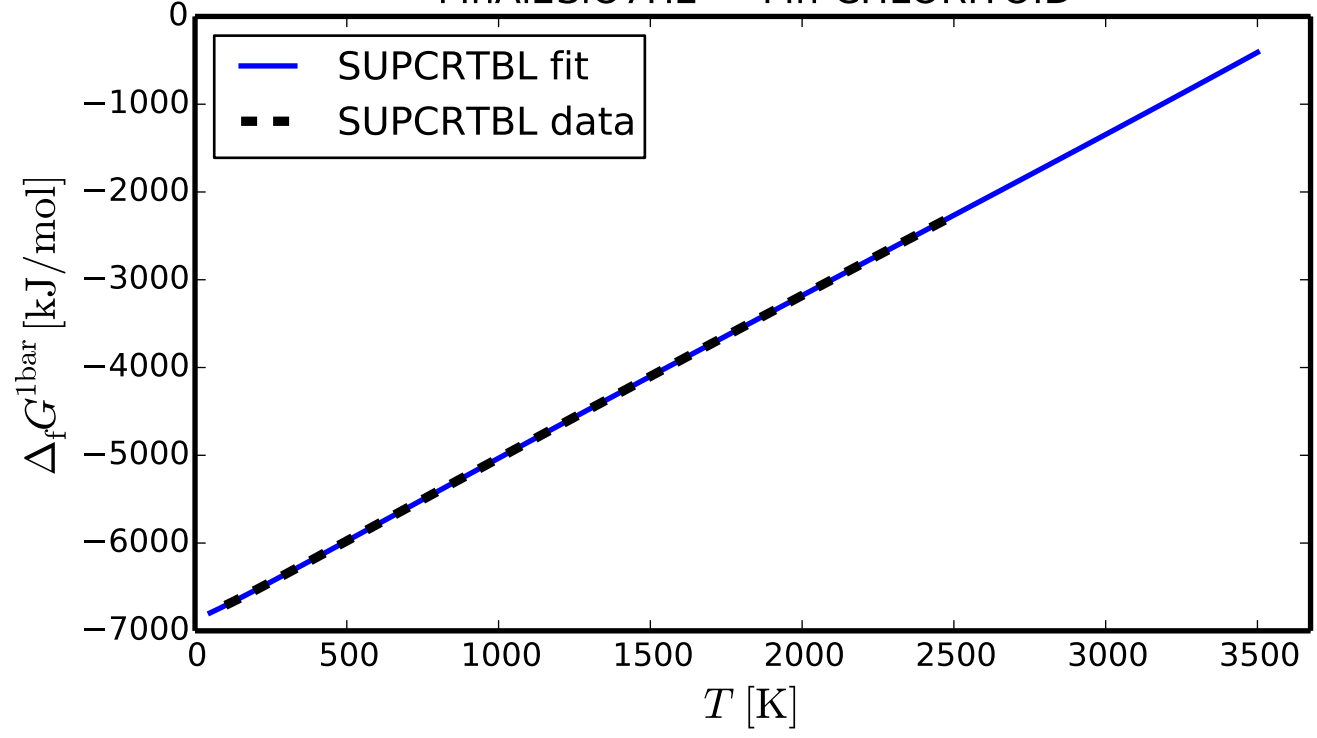
KFeAlSi4O12H2 - FERROCELADONITE



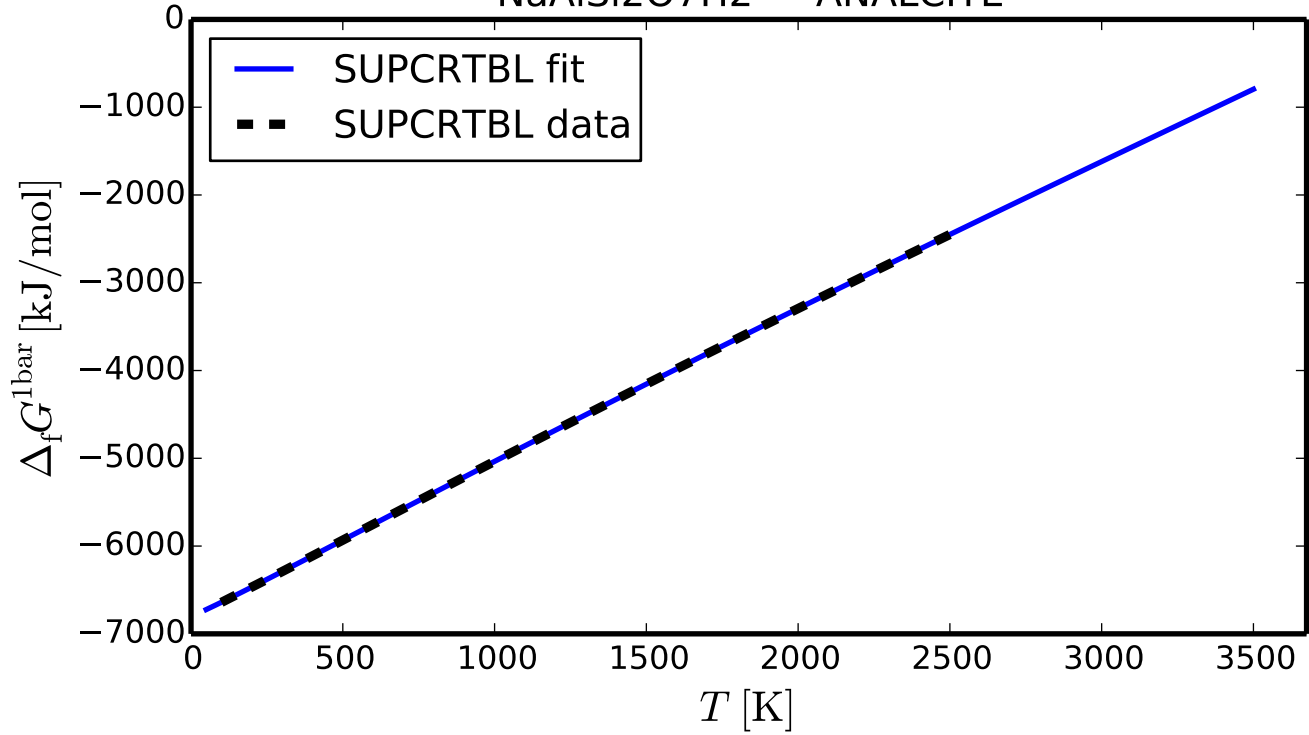
NaFeSi2O6 - ACMITE



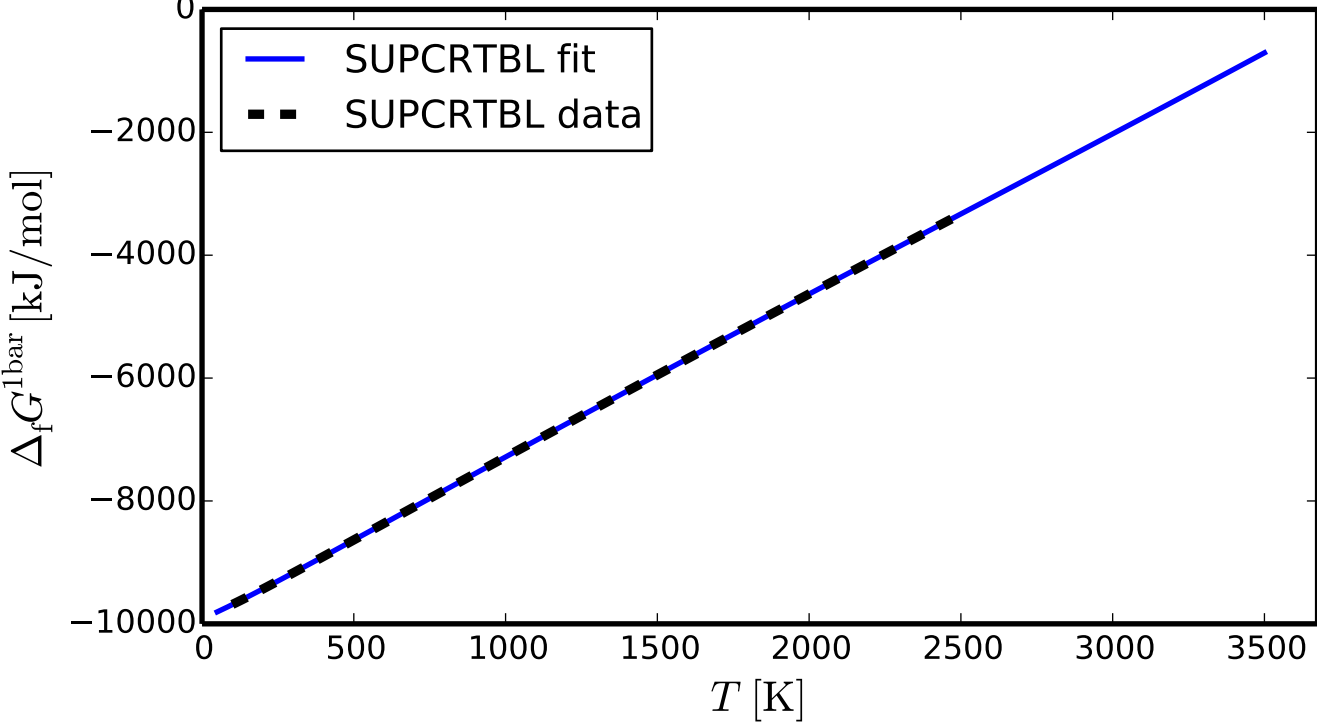
MnAl2SiO7H2 - Mn-CHLORITOID



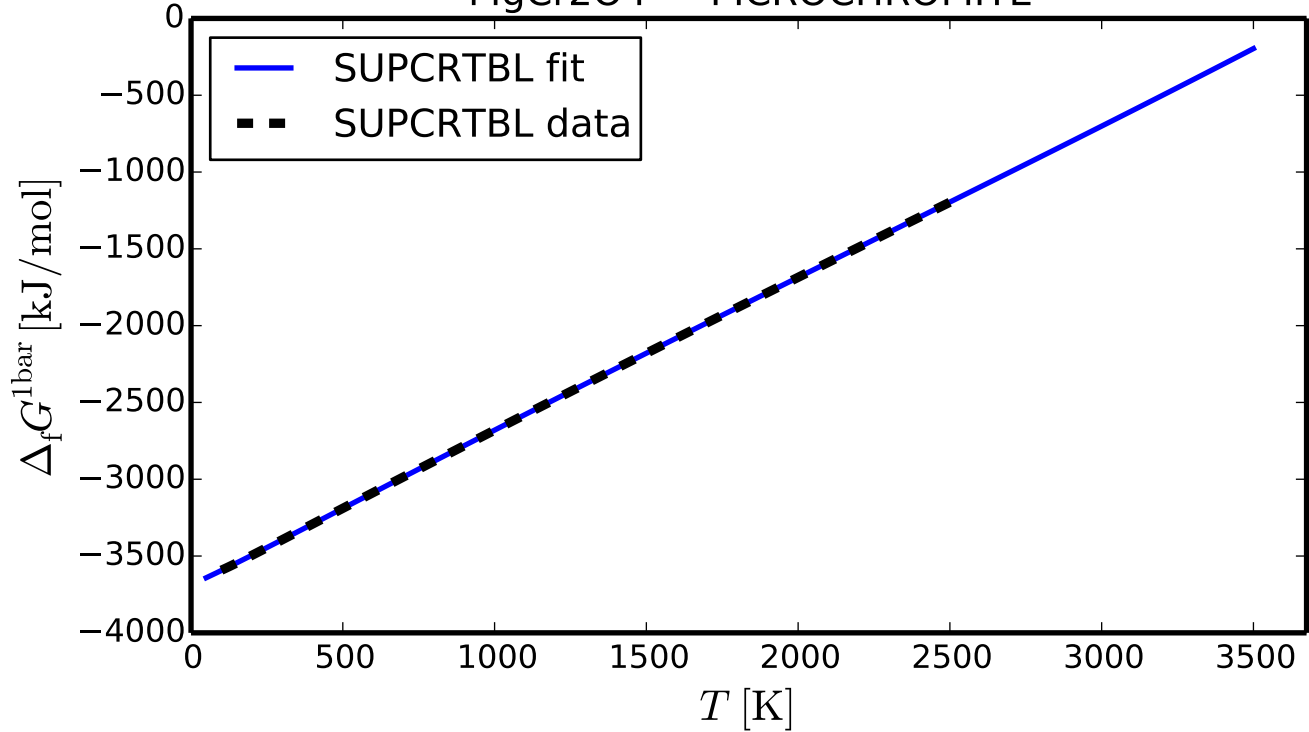
NaAlSi2O7H2 - ANALCITE



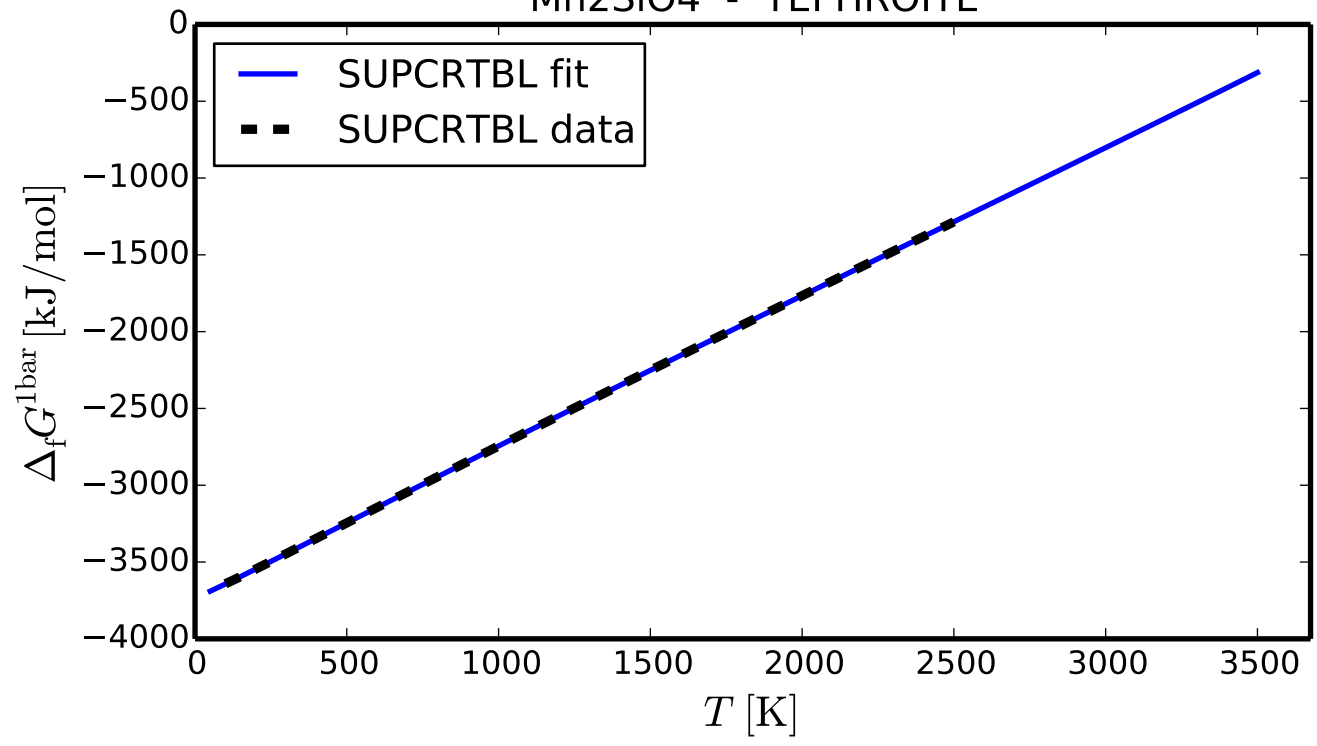
CaAl2Si2O10H4 - LAWSONITE



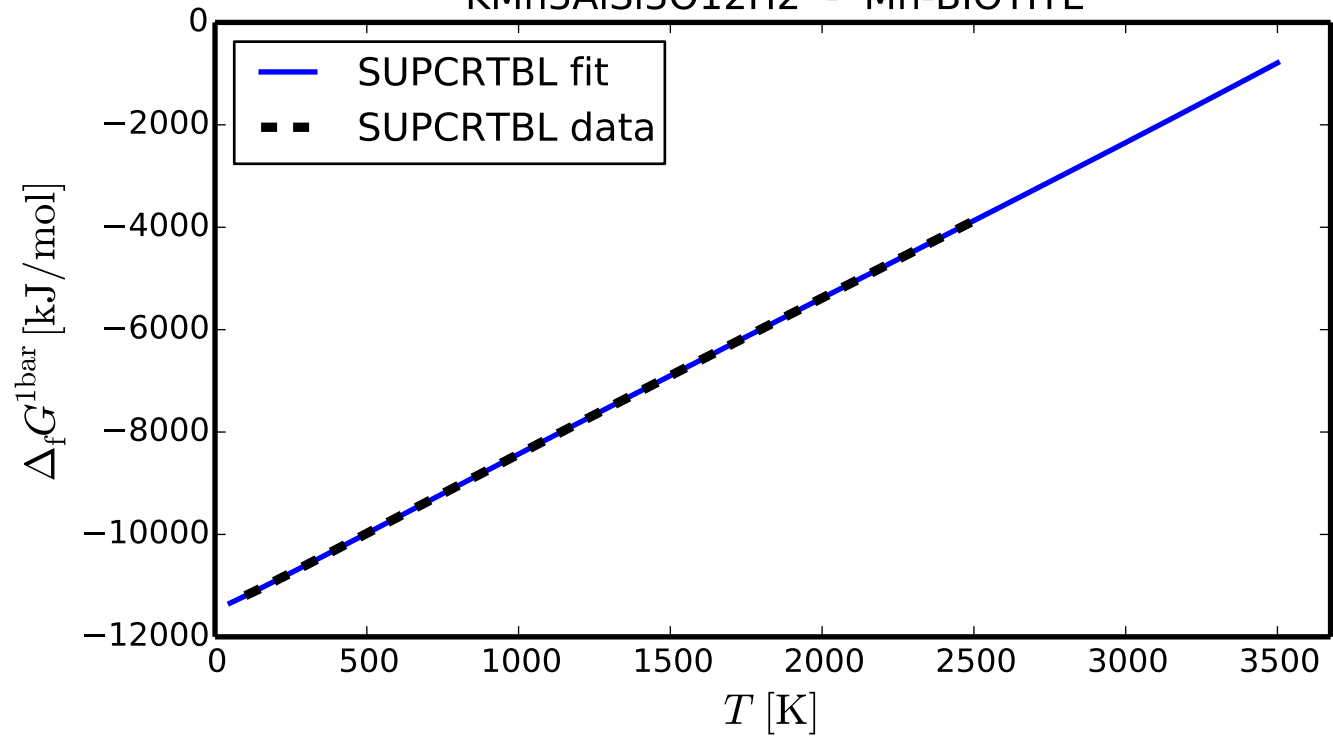
MgCr2O4 - PICROCHROMITE



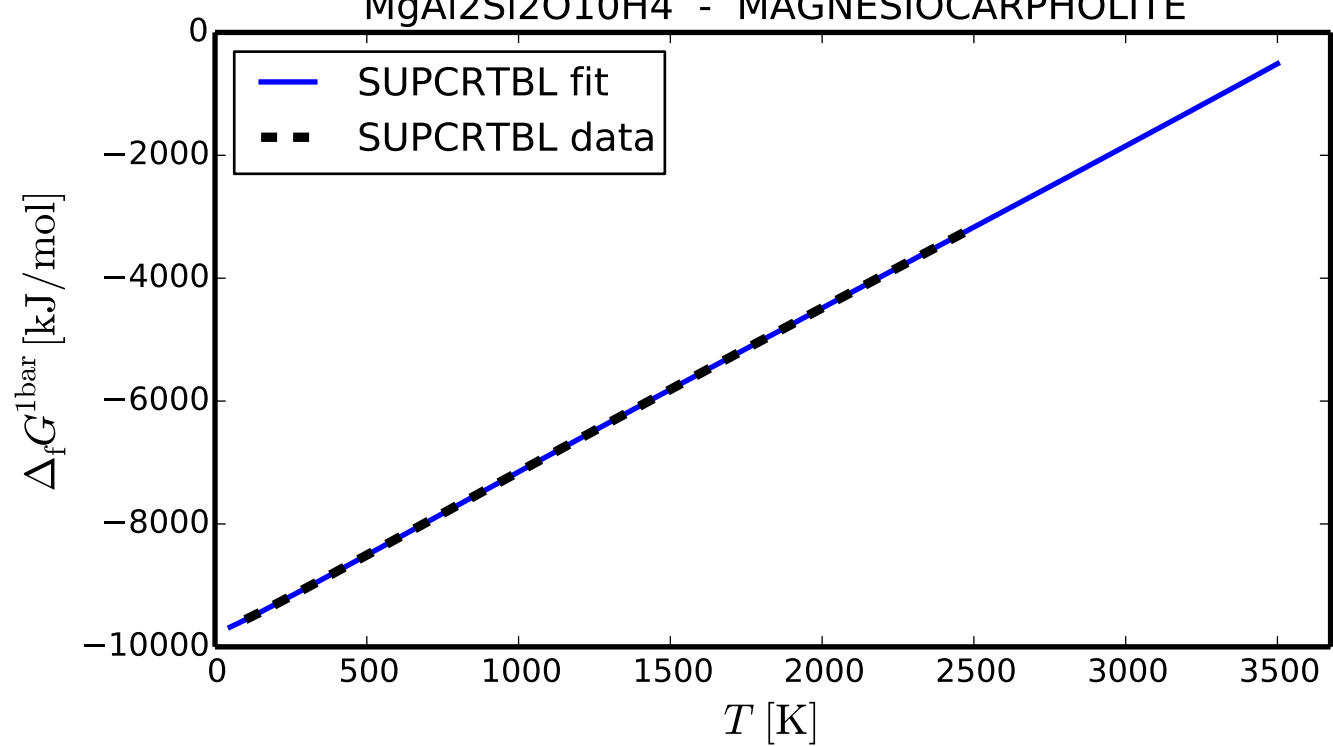
Mn₂SiO₄ - TEPHROITE



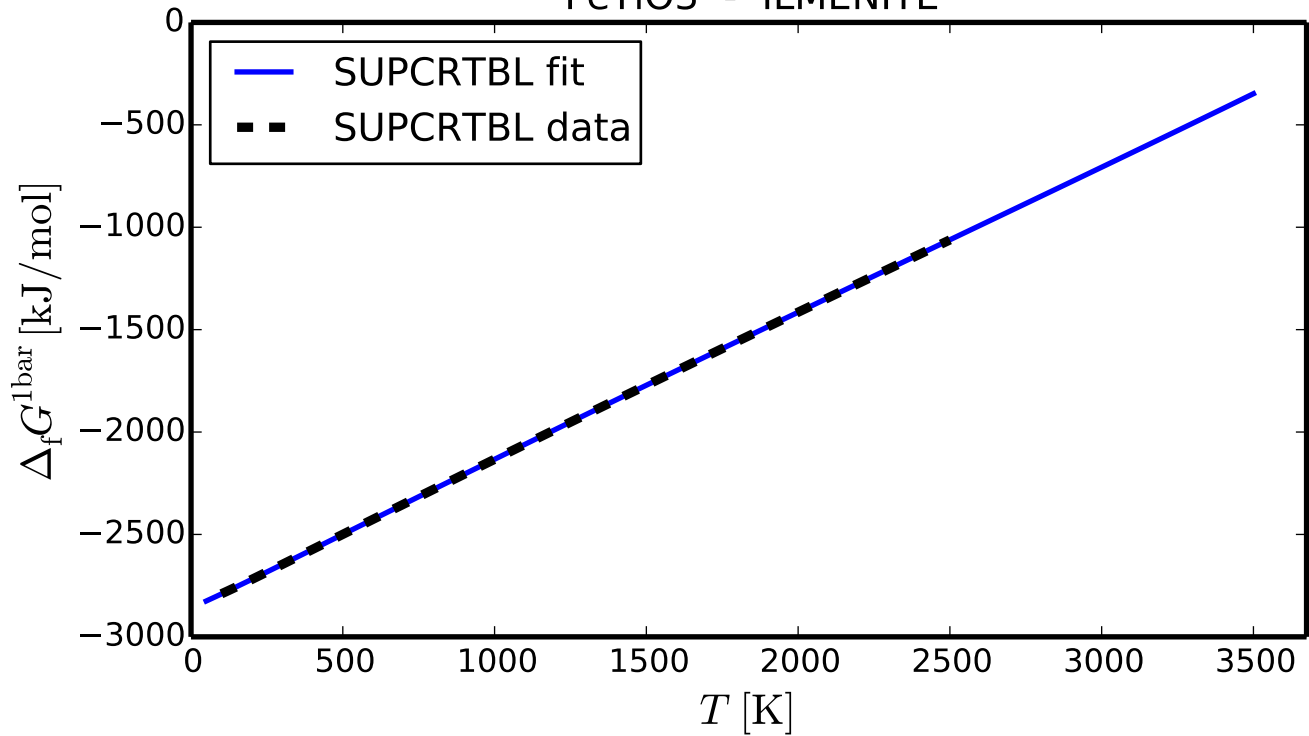
KMn3AlSi3O12H2 - Mn-BIOTITE



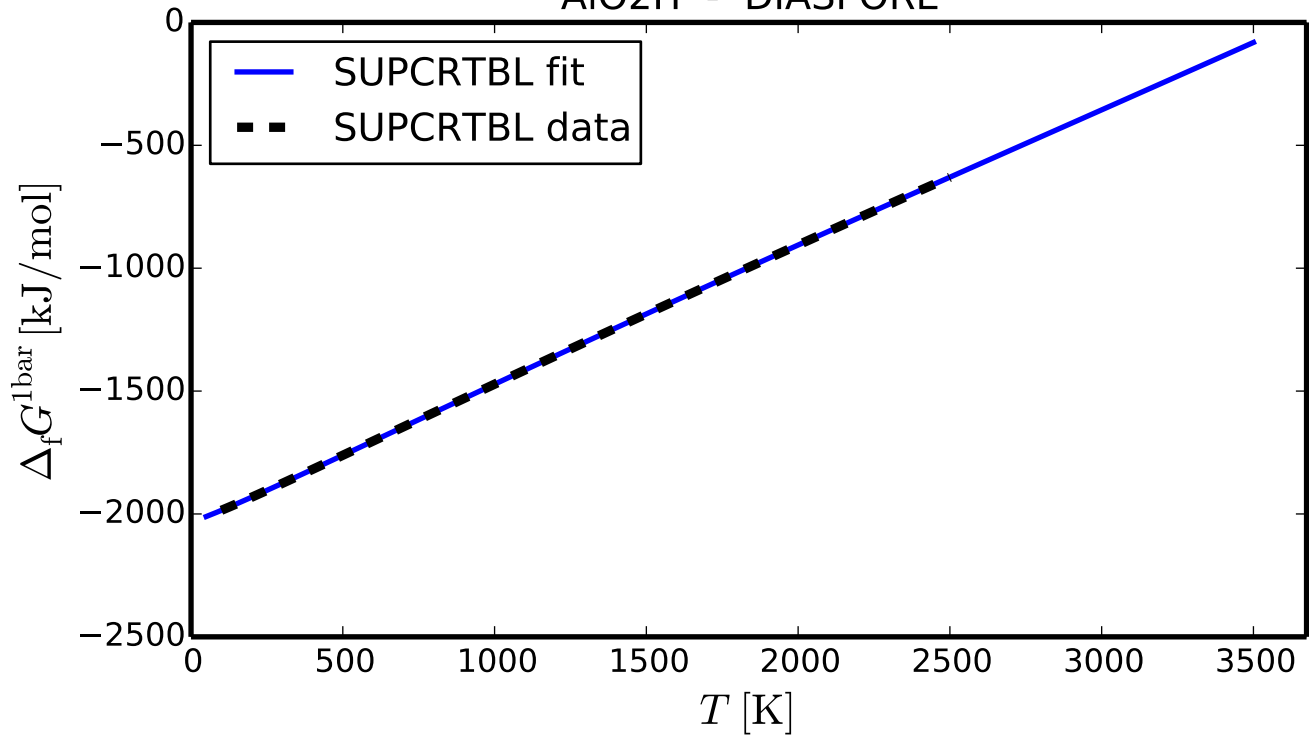
MgAl2Si2O10H4 - MAGNESIOCARPHOLITE



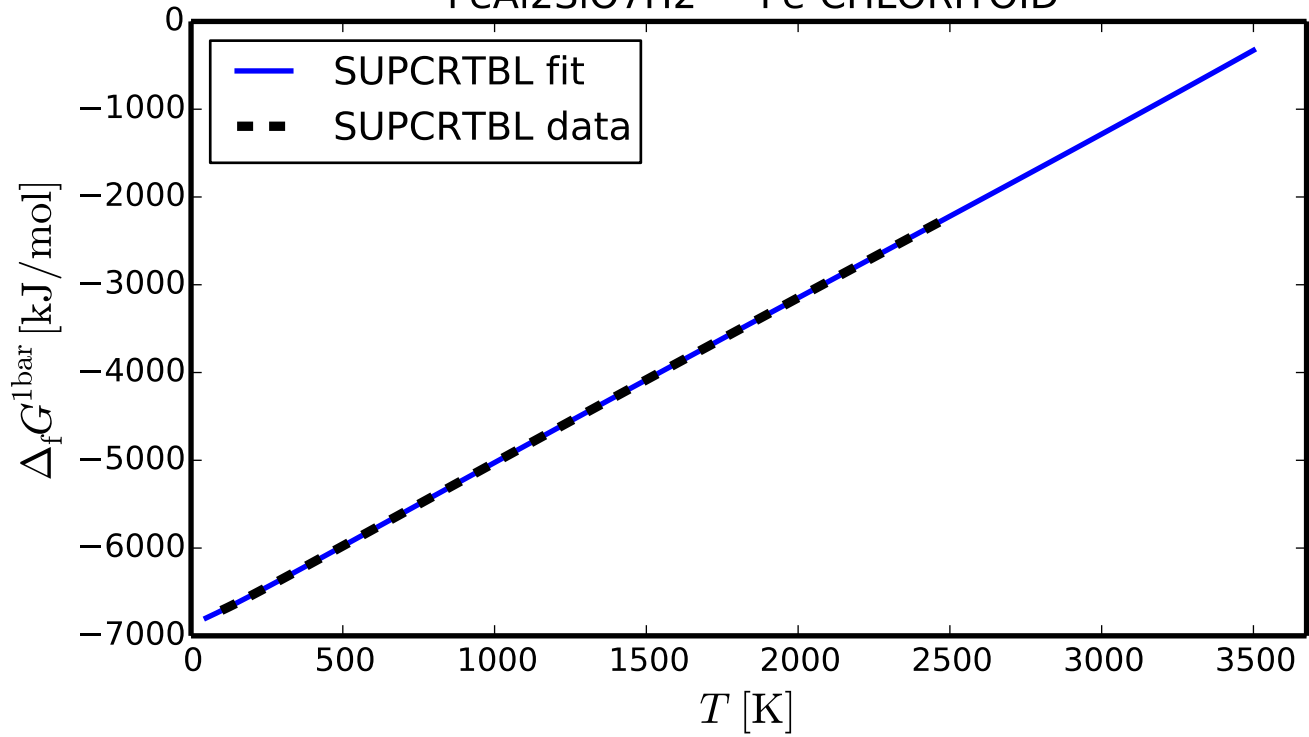
FeTiO3 - ILMENITE



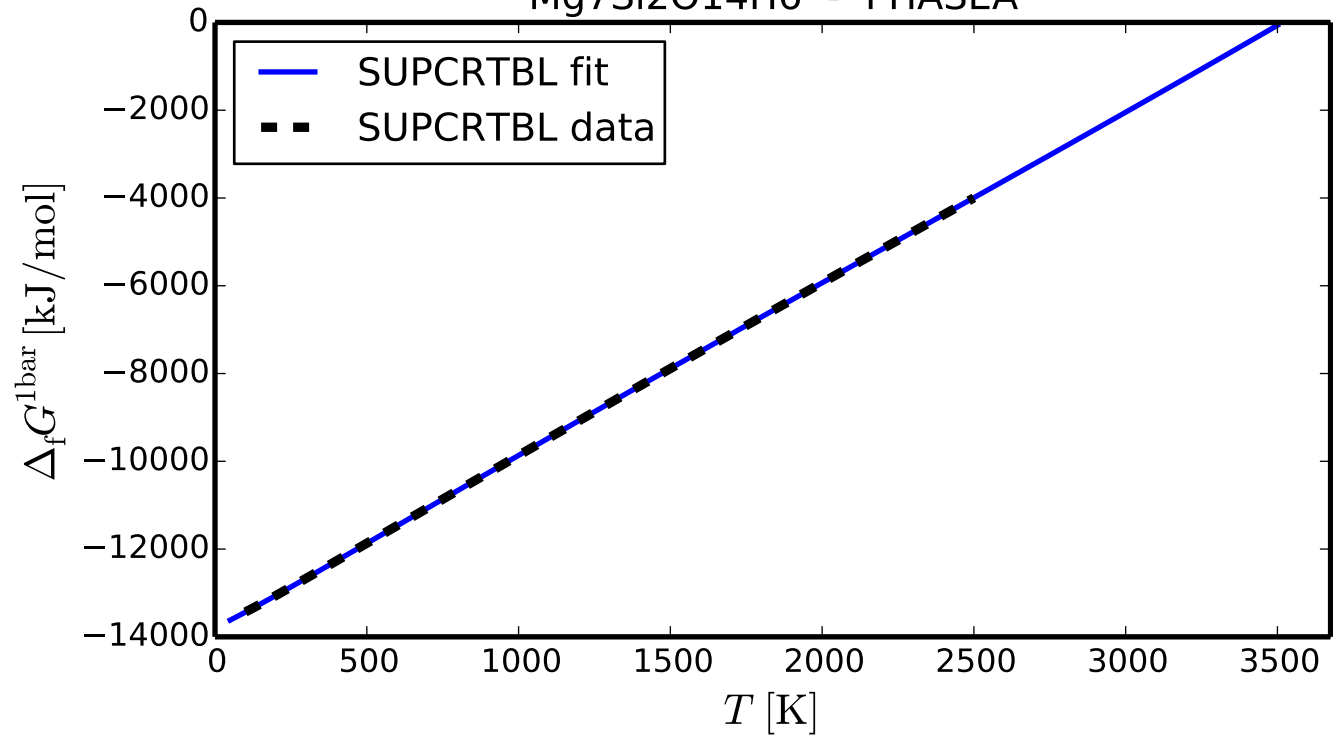
AIO2H - DIASPORE



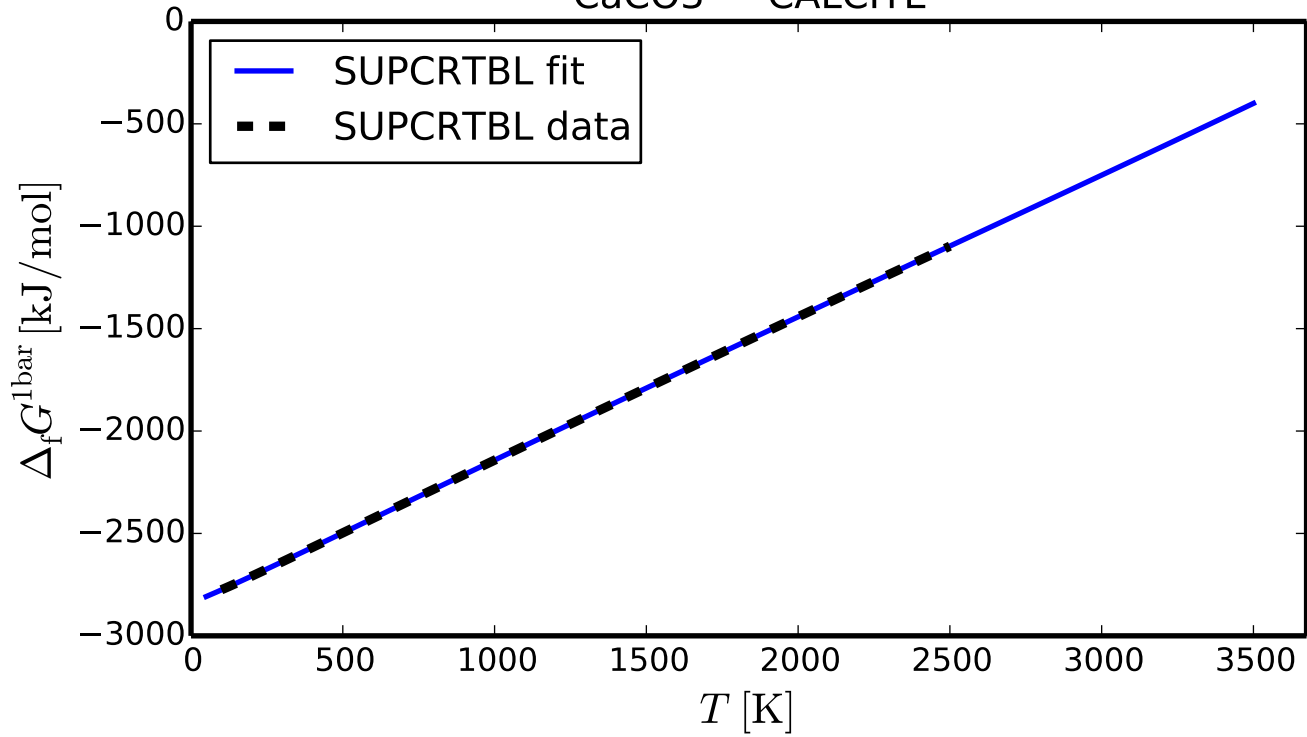
FeAl2SiO7H2 - Fe-CHLORITOID



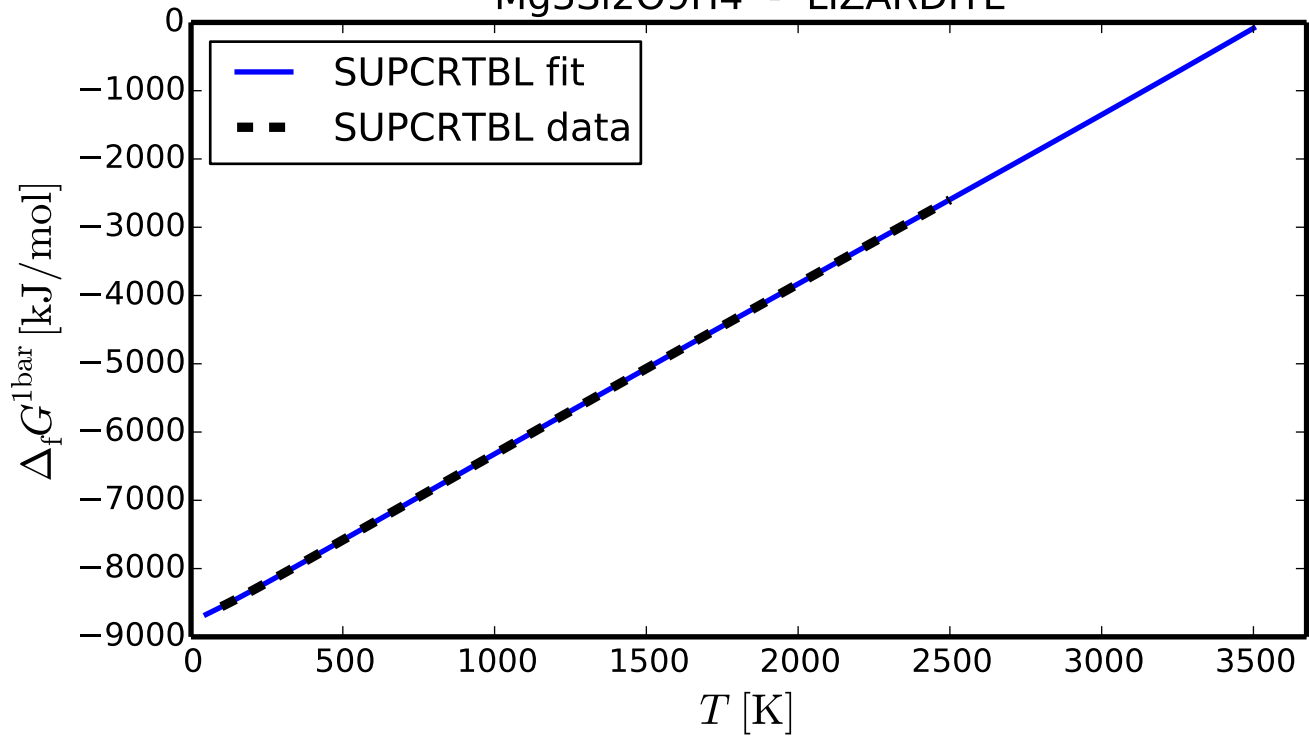
Mg7Si2O14H6 - PHASEA

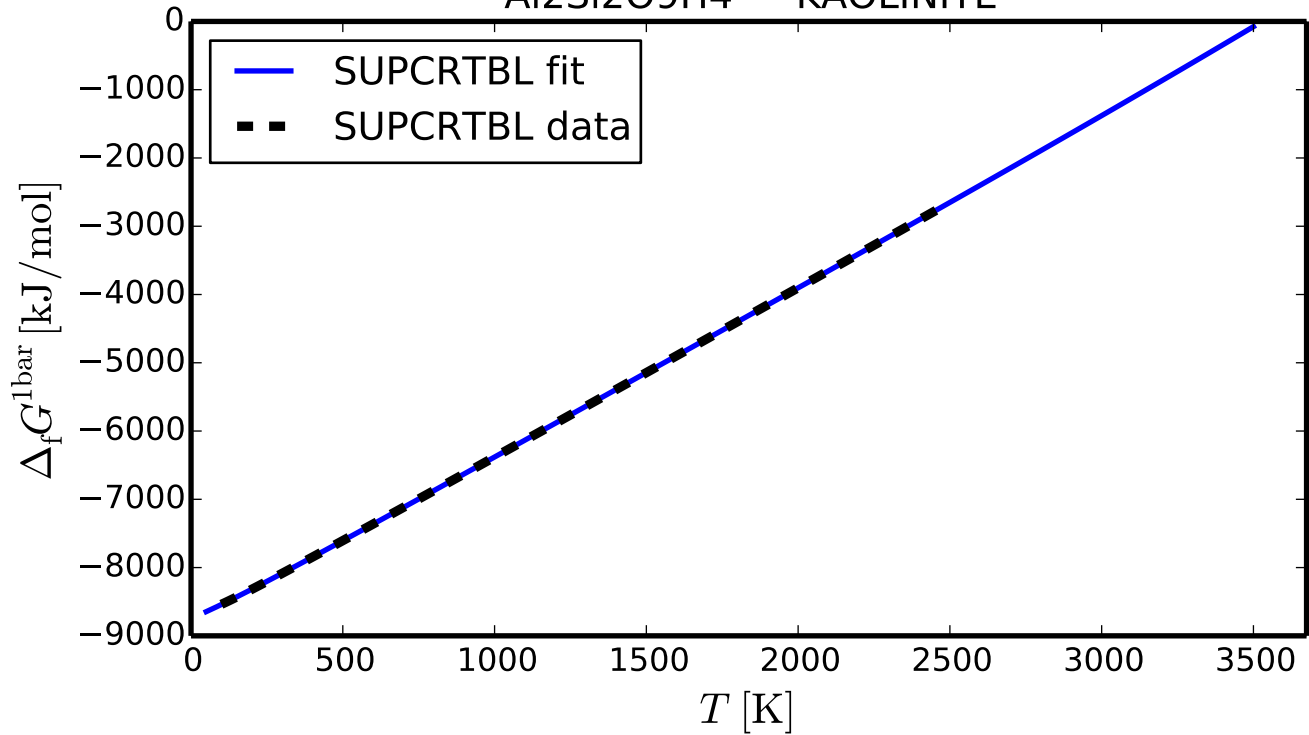


CaCO3 - CALCITE

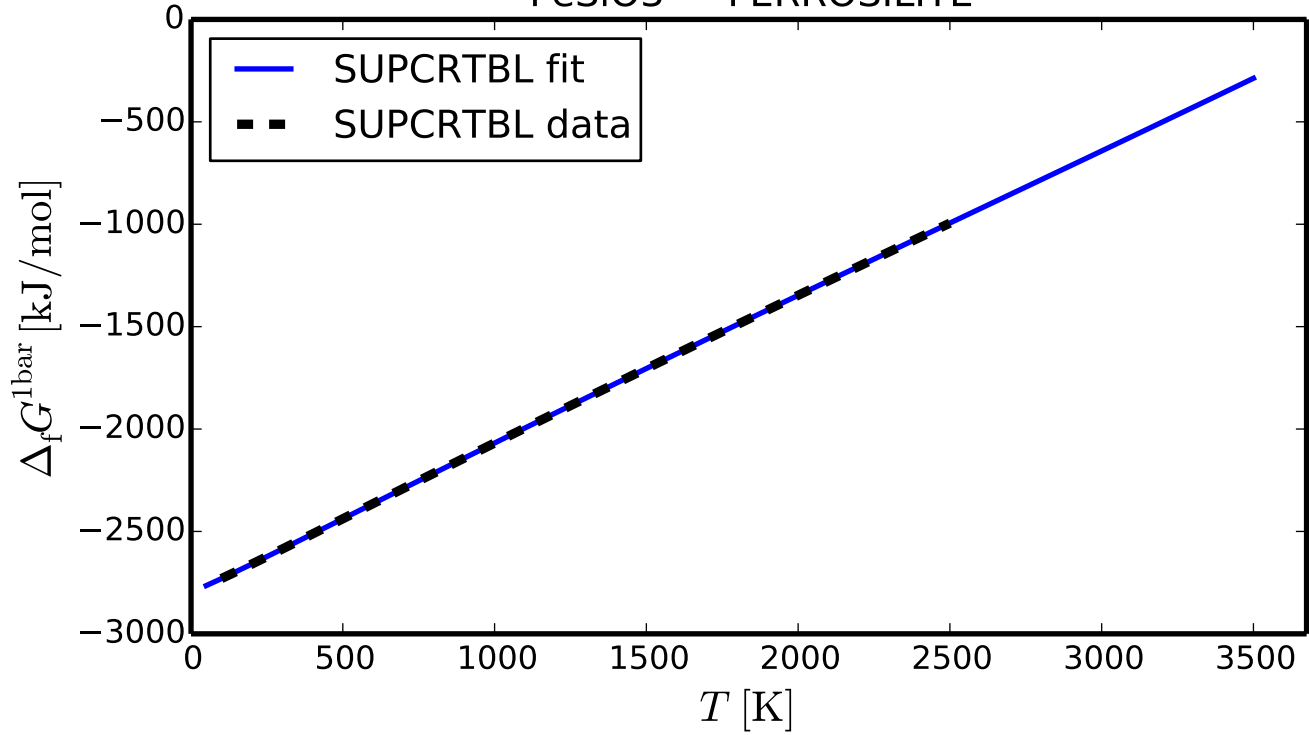


Mg₃Si₂O₉H₄ - LIZARDITE

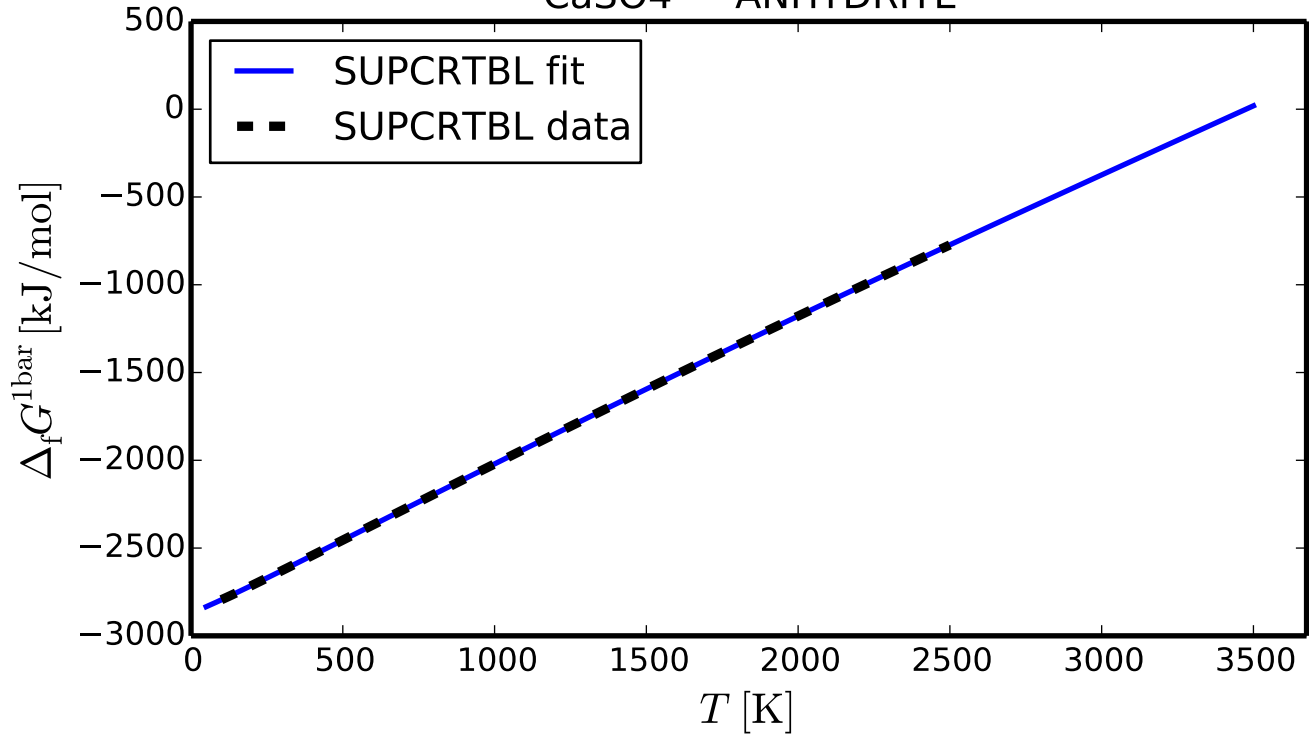


Al₂Si₂O₉H₄ - KAOLINITE

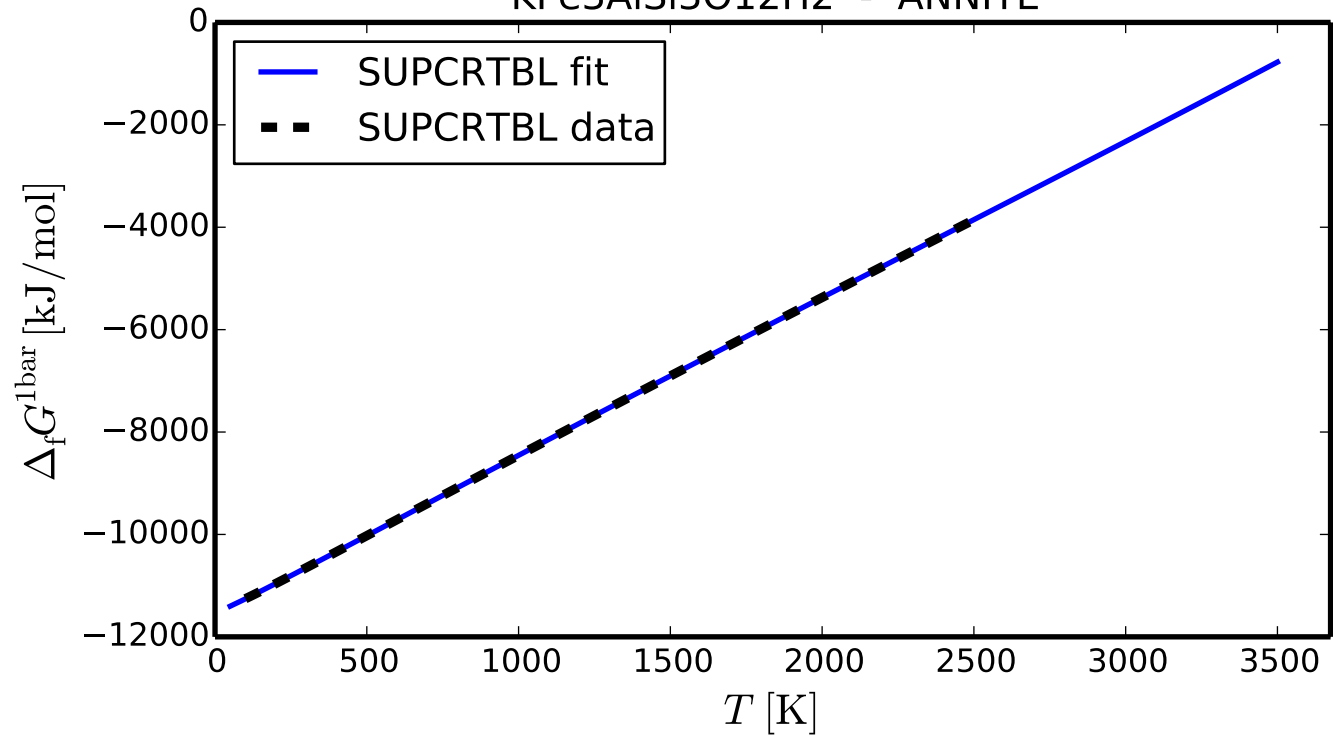
FeSiO3 - FERROSILITE



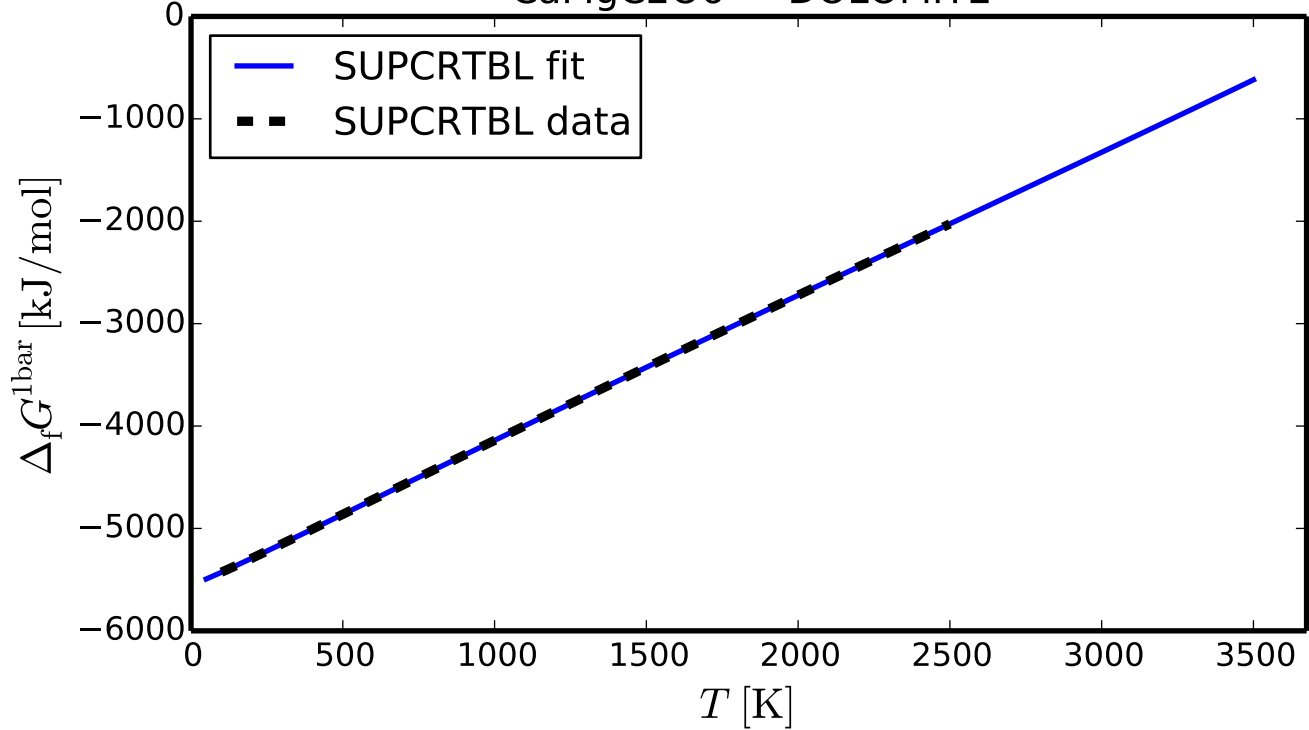
CaSO4 - ANHYDRITE

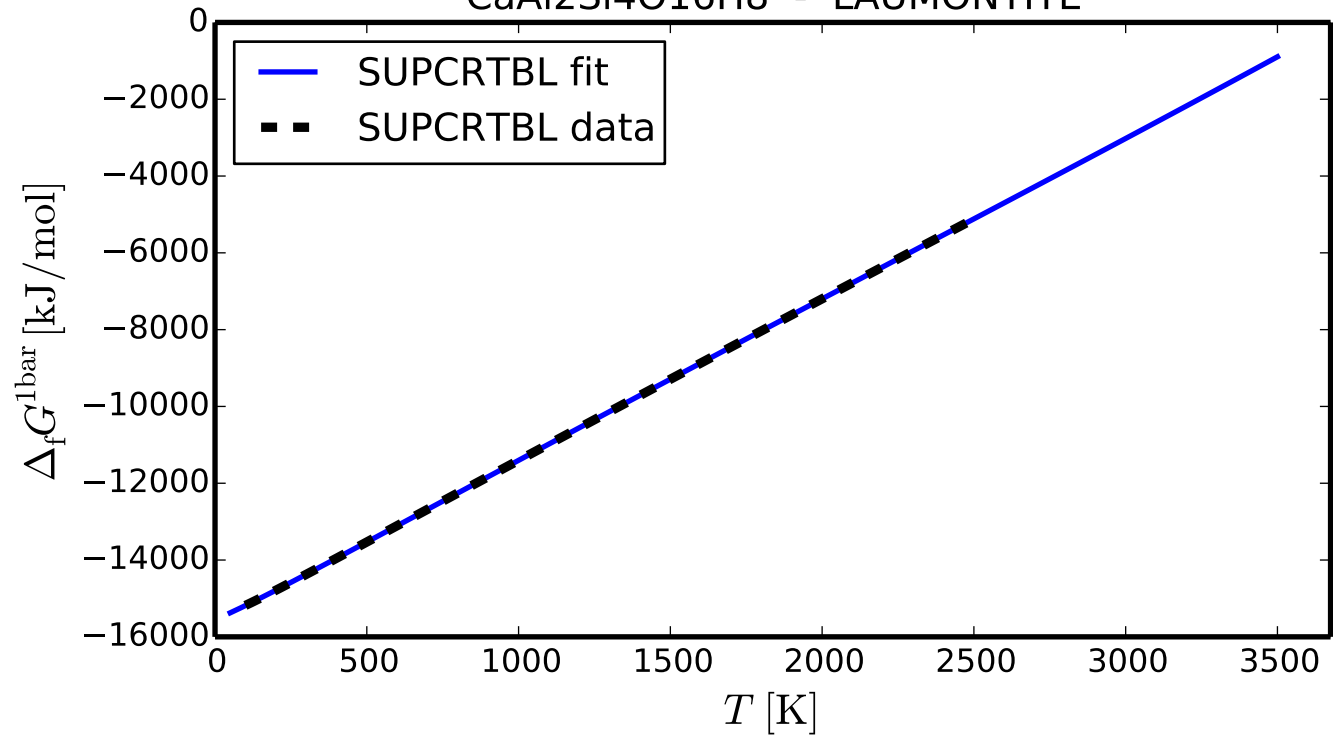


KFe3AlSi3O12H2 - ANNITE

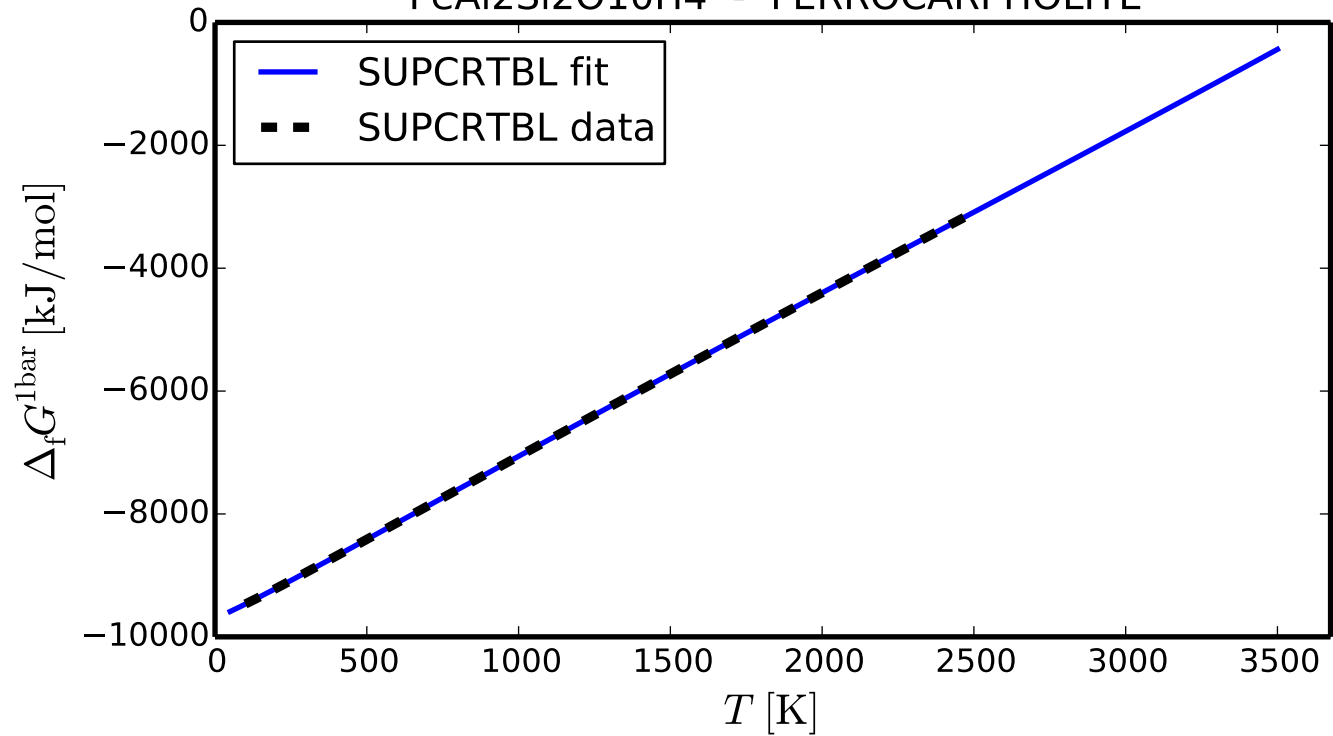


CaMgC2O6 - DOLOMITE

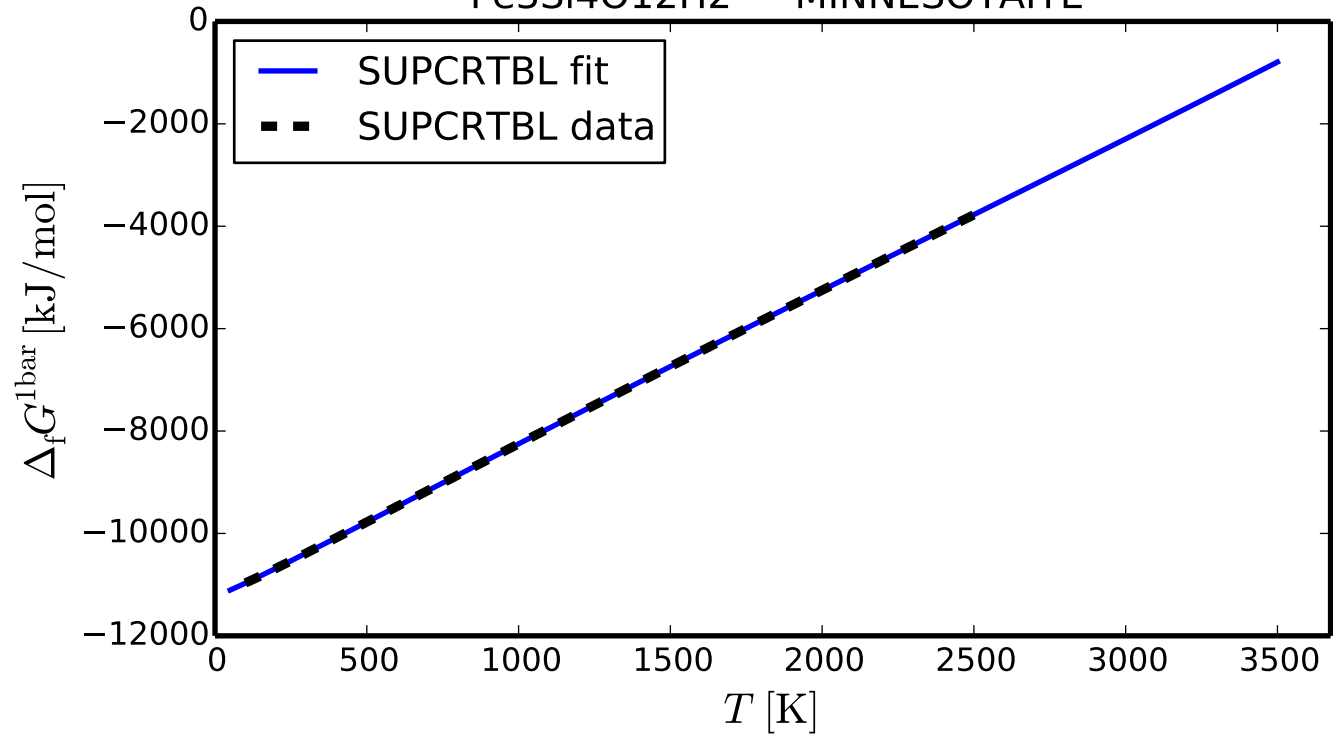


CaAl₂Si₄O₁₆H₈ - LAUMONTITE

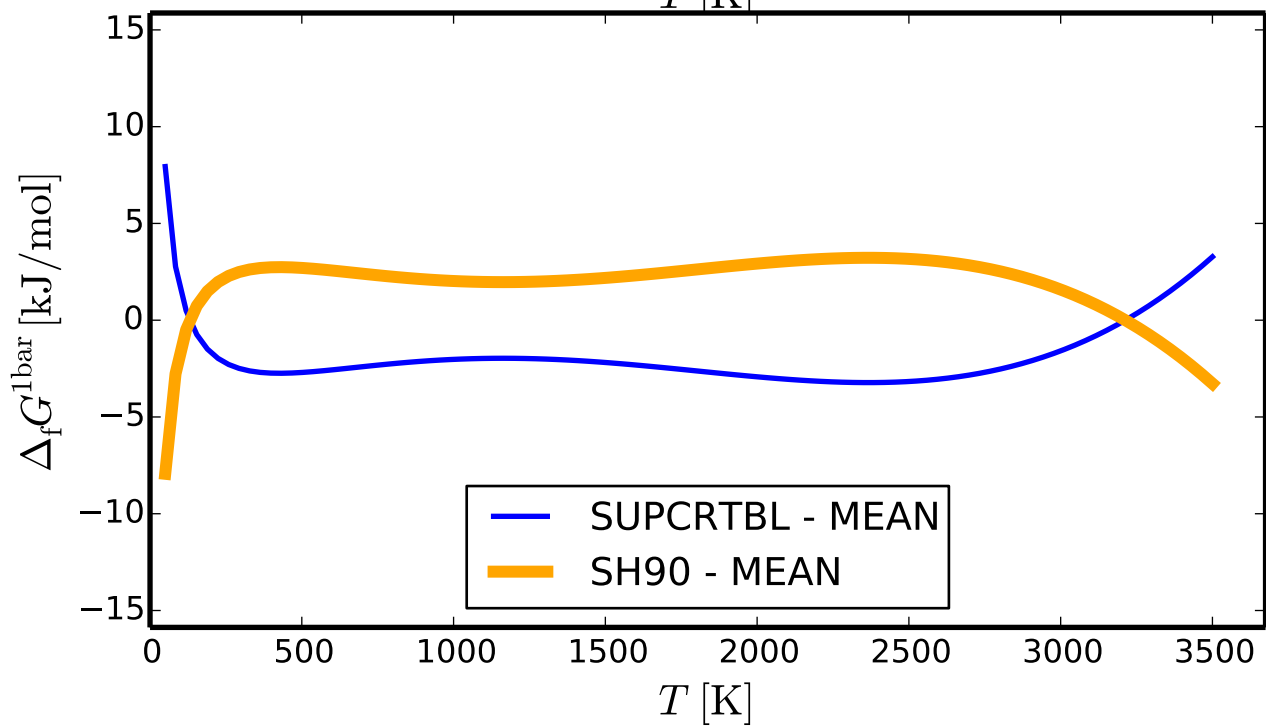
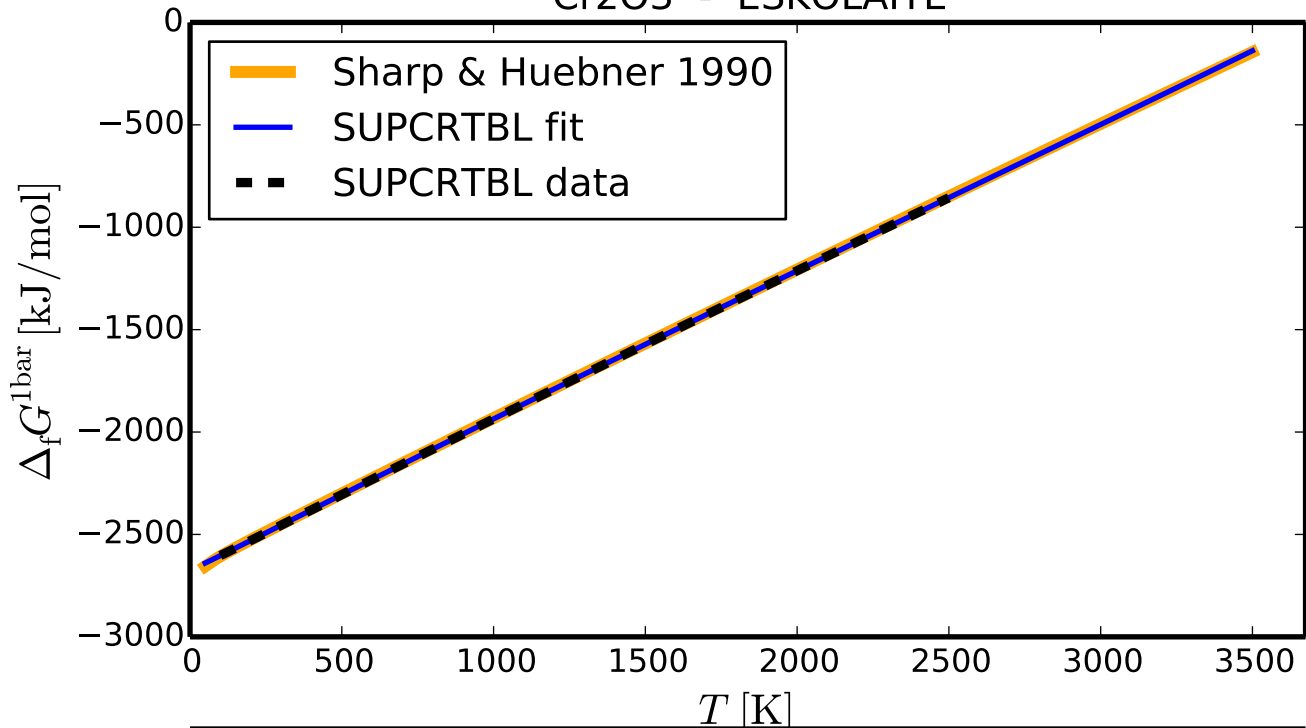
FeAl2Si2O10H4 - FERROCARPHOLITE



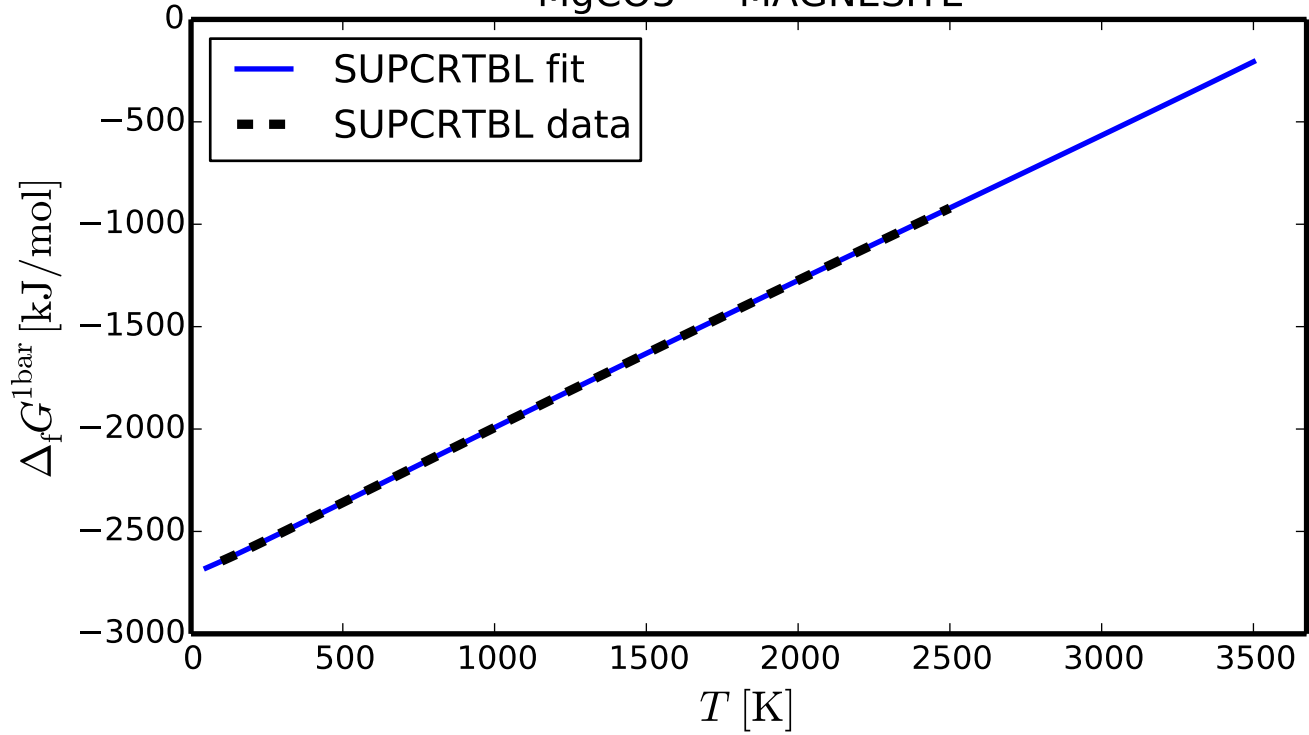
Fe3Si4O12H2 - MINNESOTAITE



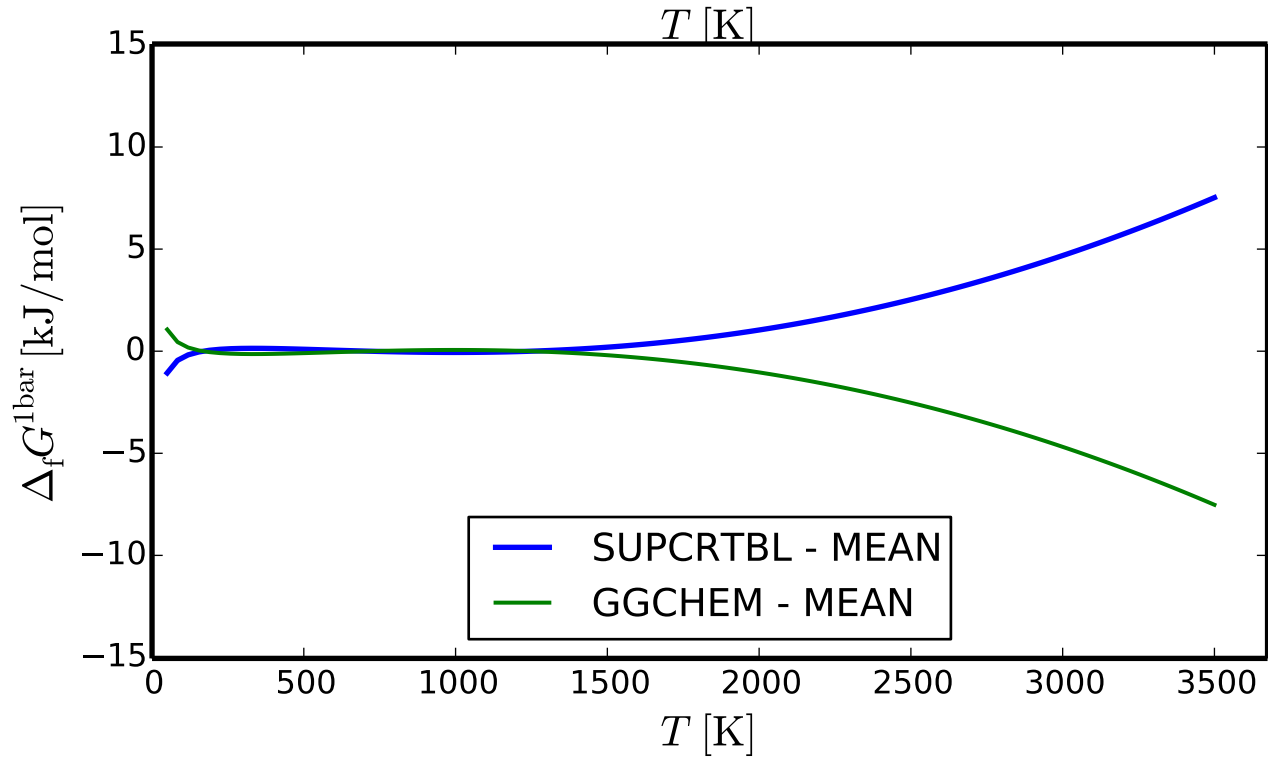
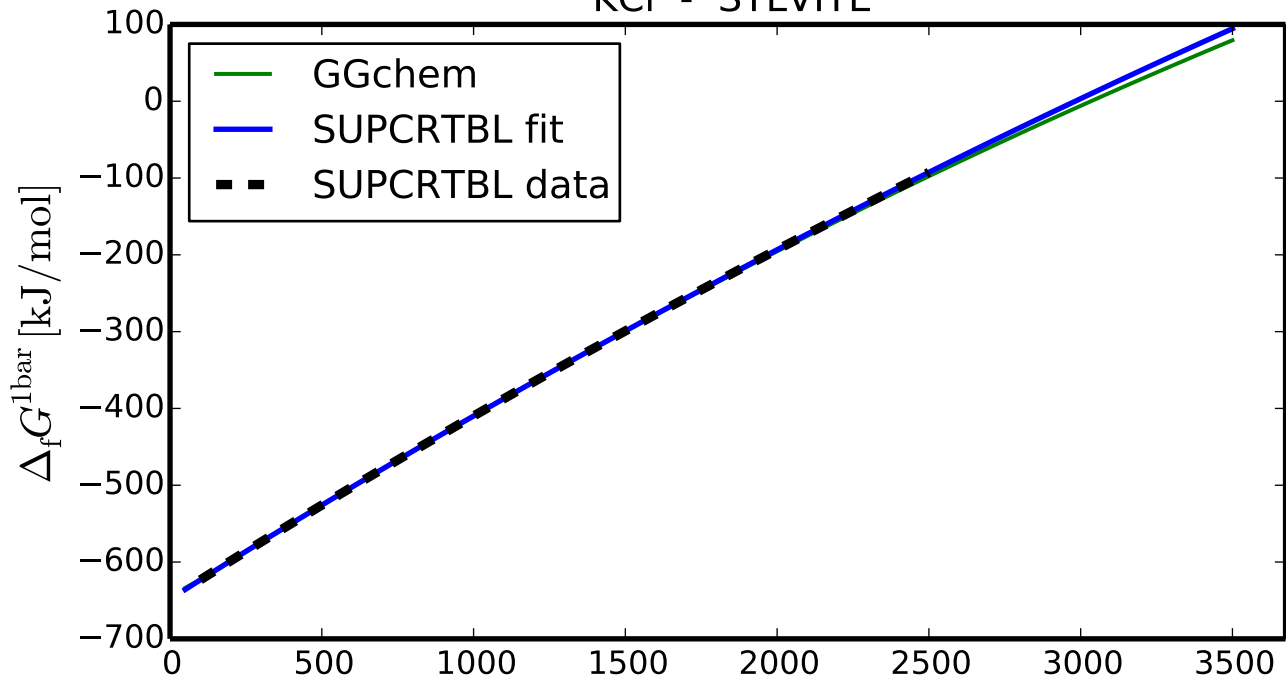
Cr2O3 - ESKOLAITE



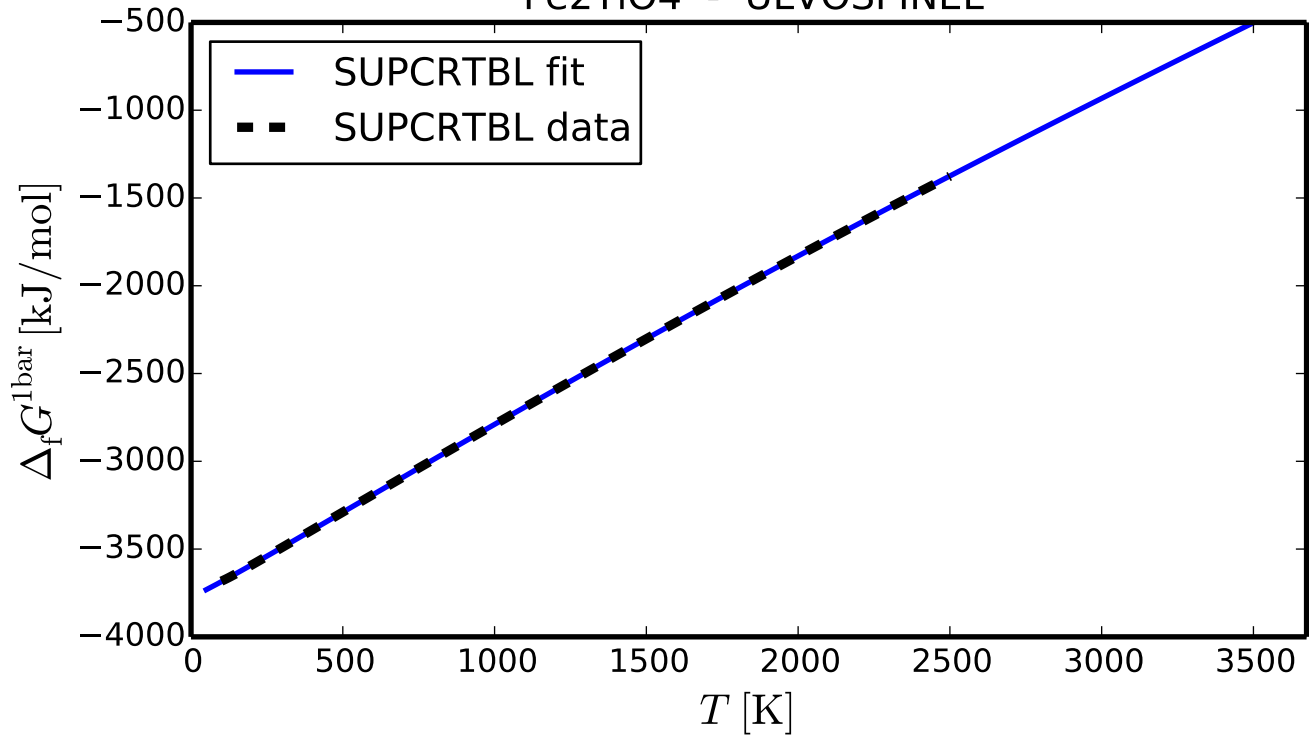
MgCO3 - MAGNESITE



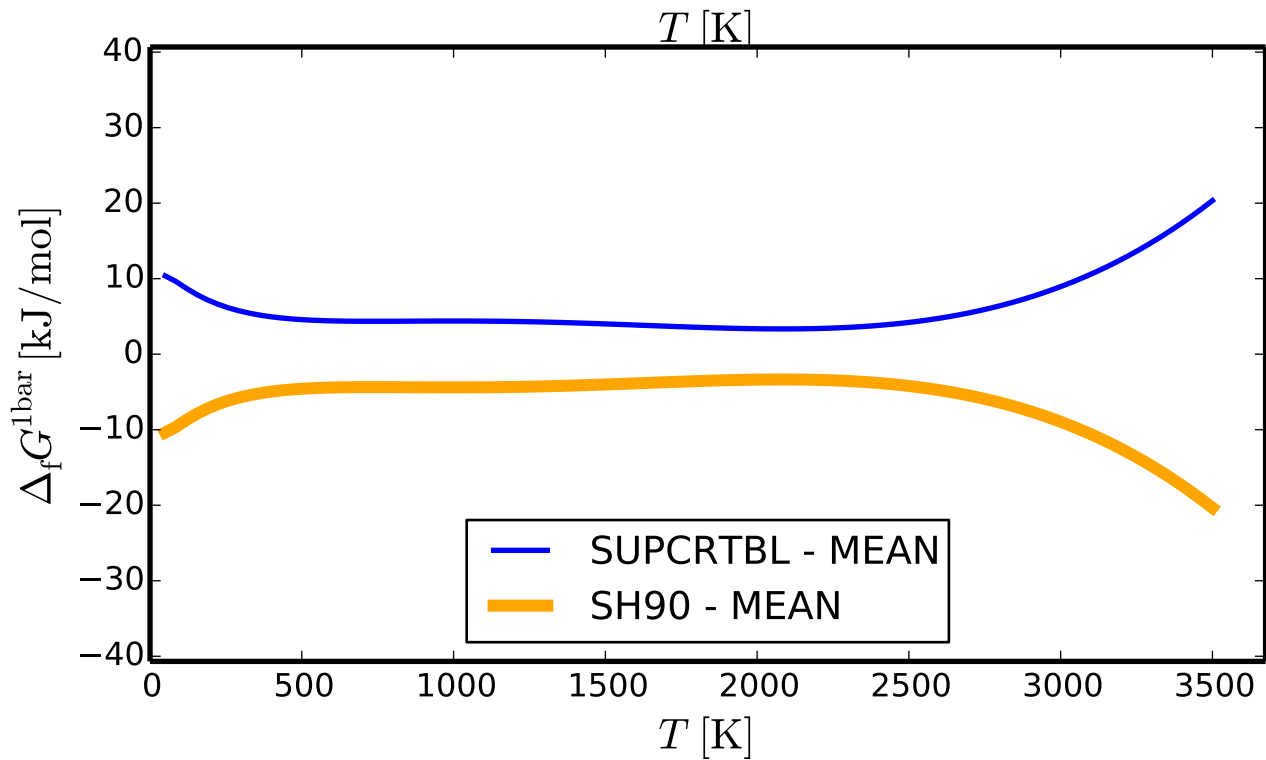
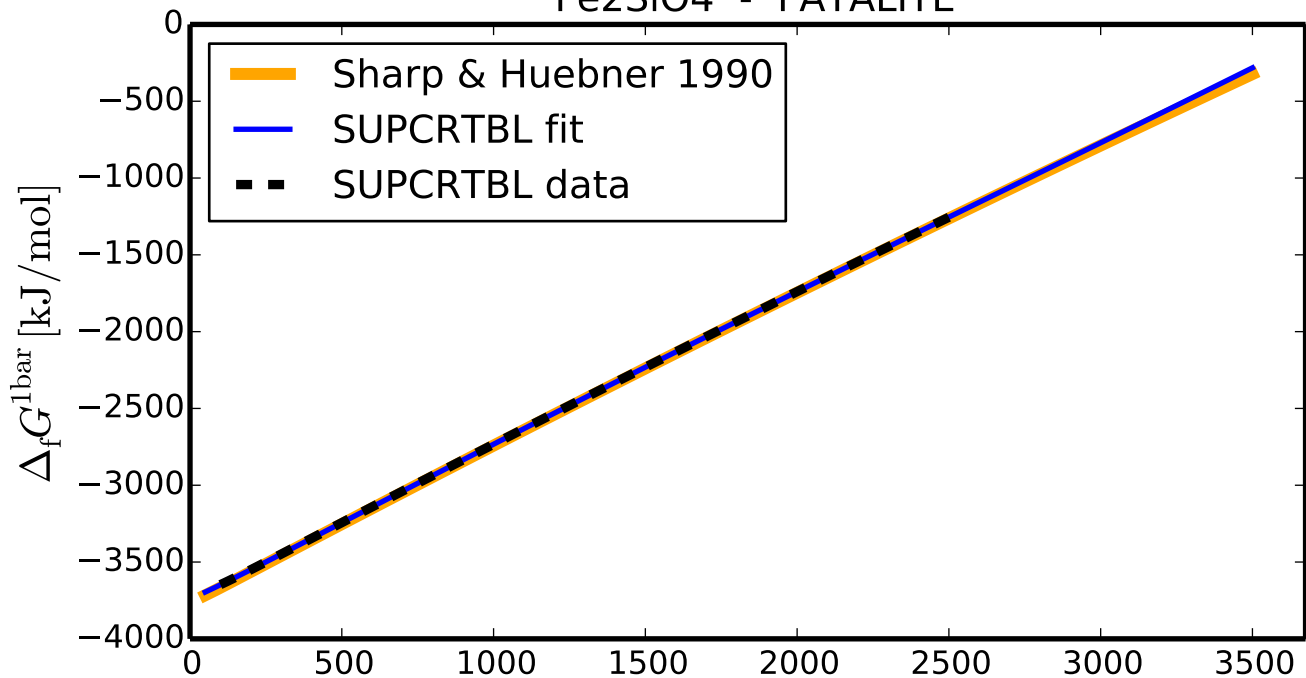
KCl - SYLVITE



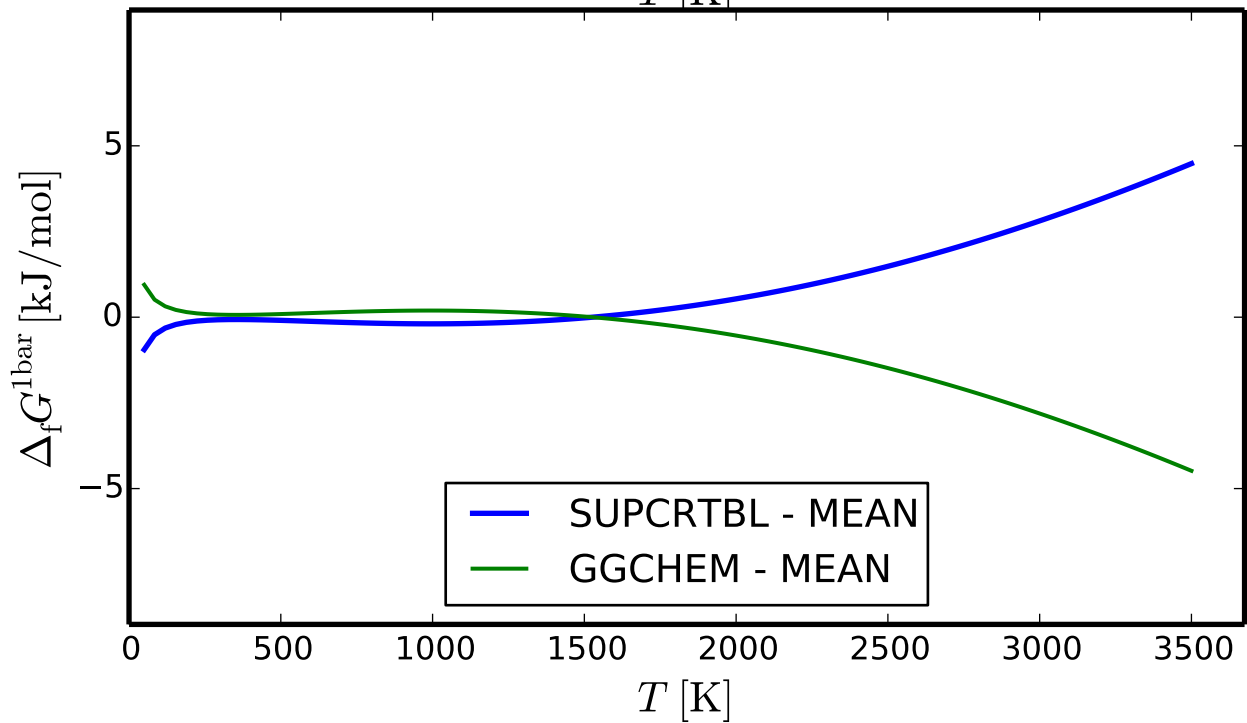
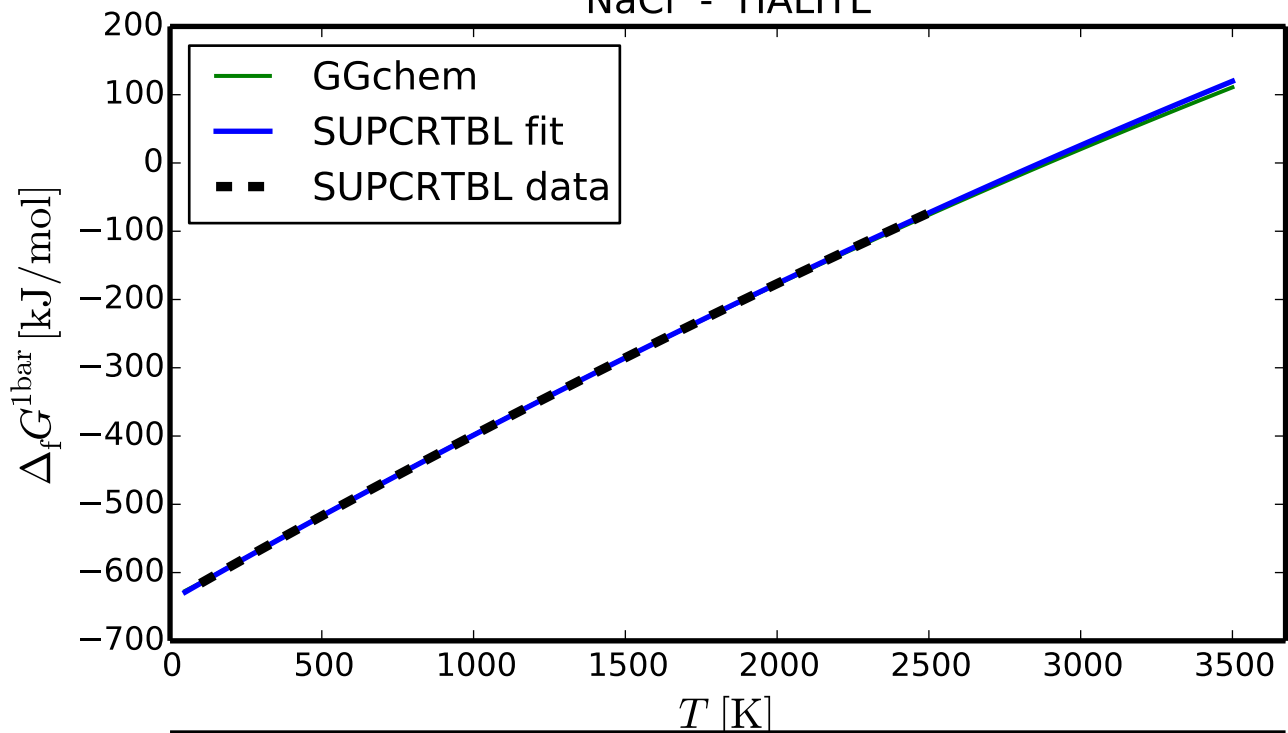
Fe2TiO4 - ULVOSPINEL



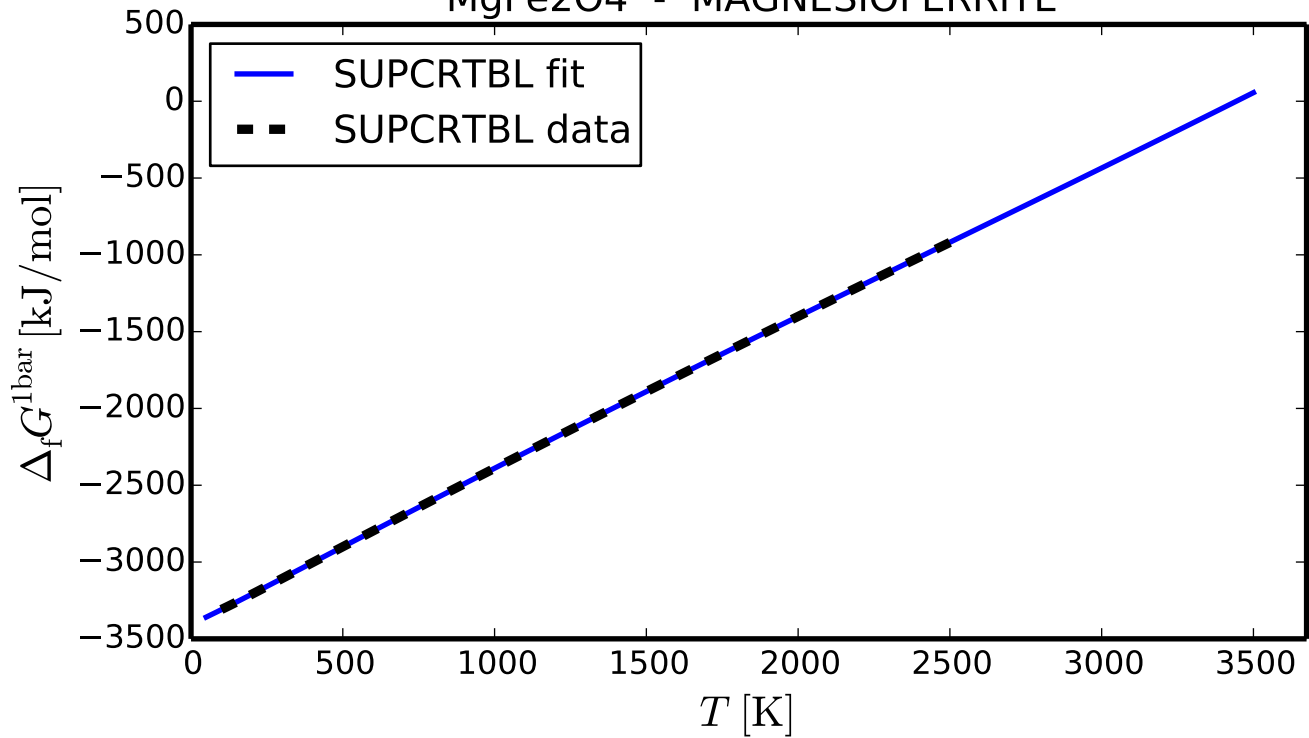
Fe2SiO4 - FAYALITE



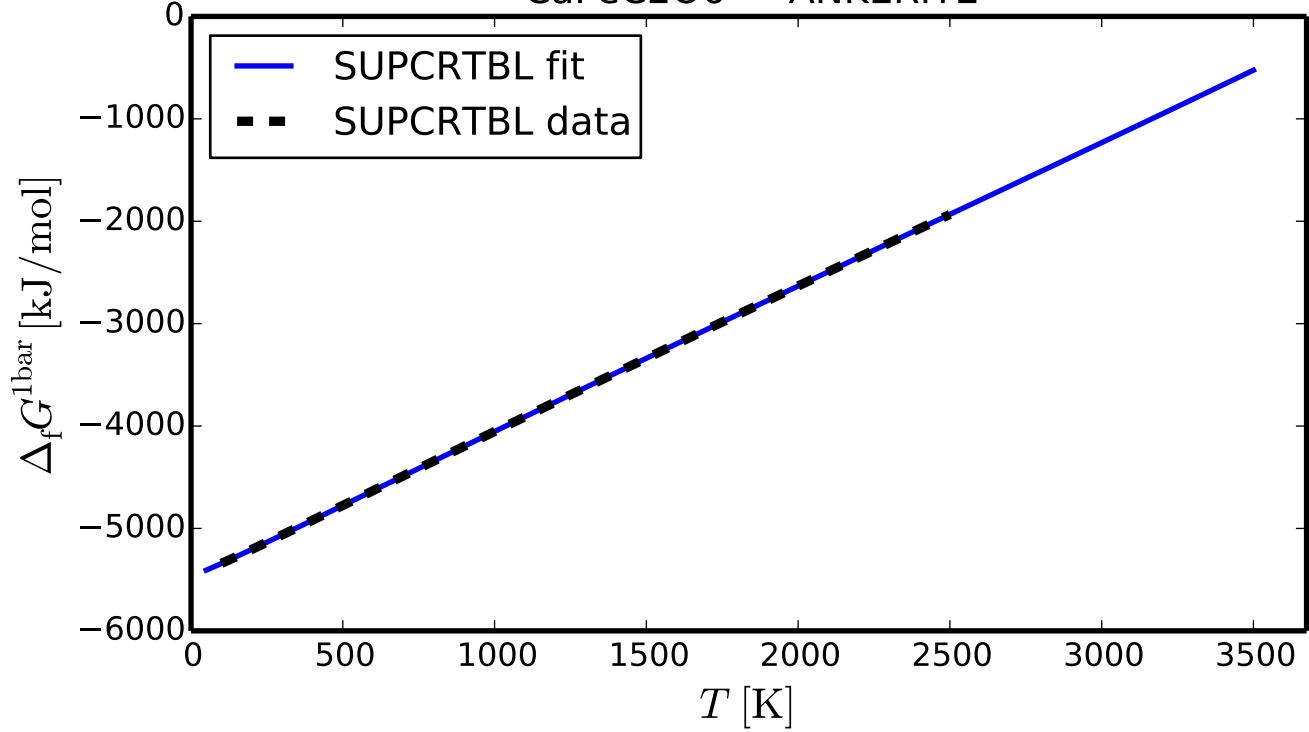
NaCl - HALITE



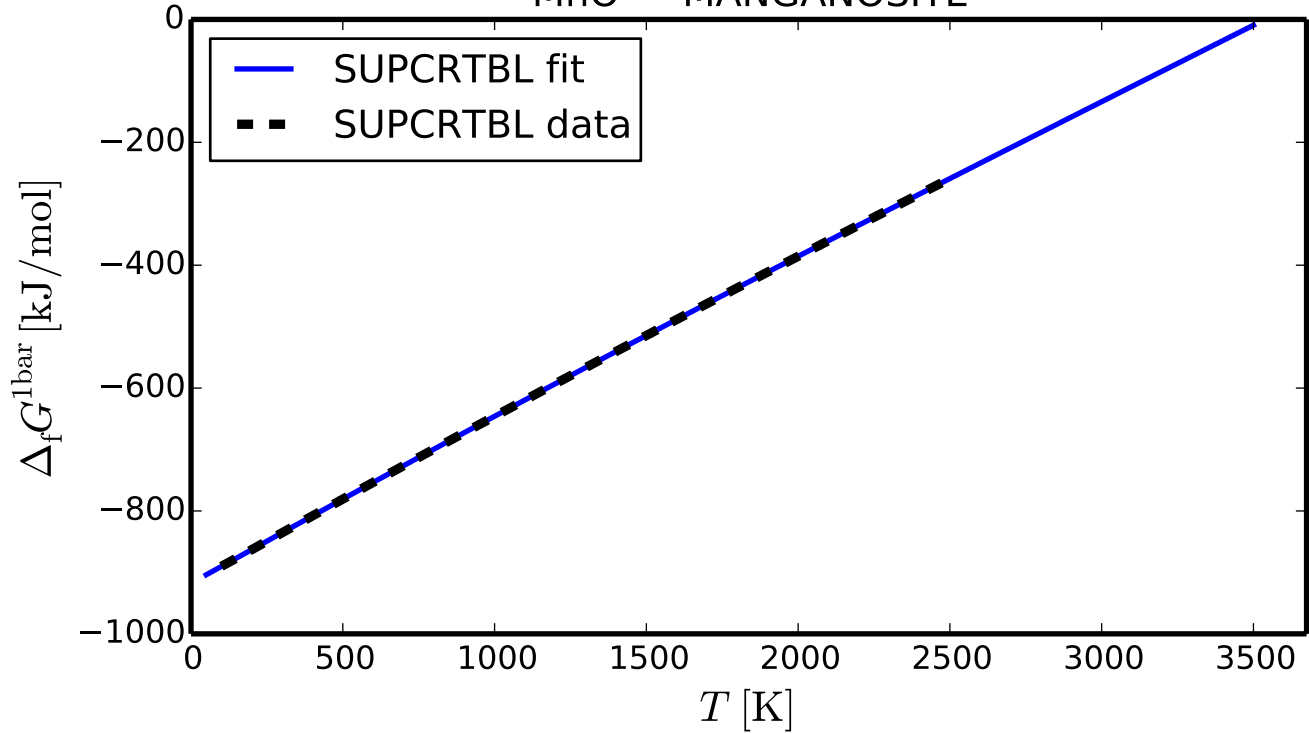
MgFe2O4 - MAGNESIOFERRITE



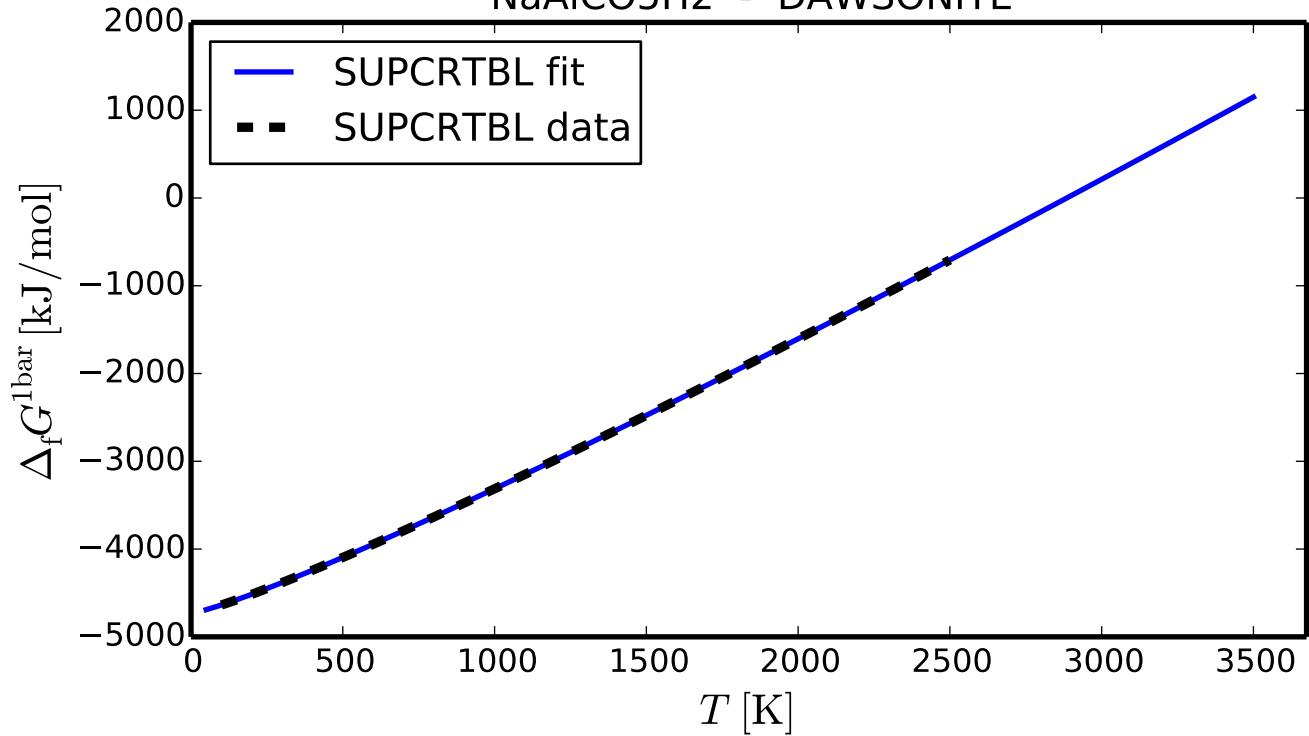
CaFeC2O6 - ANKERITE



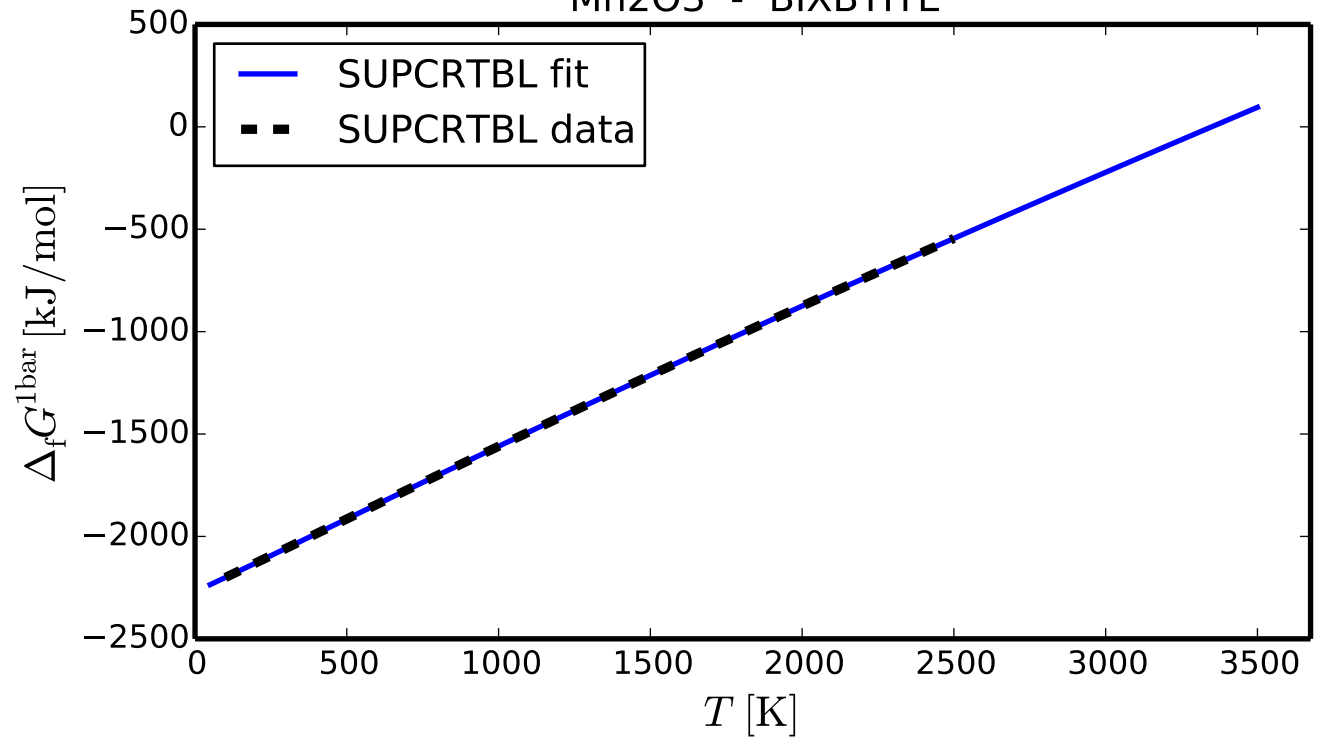
MnO - MANGANOSITE



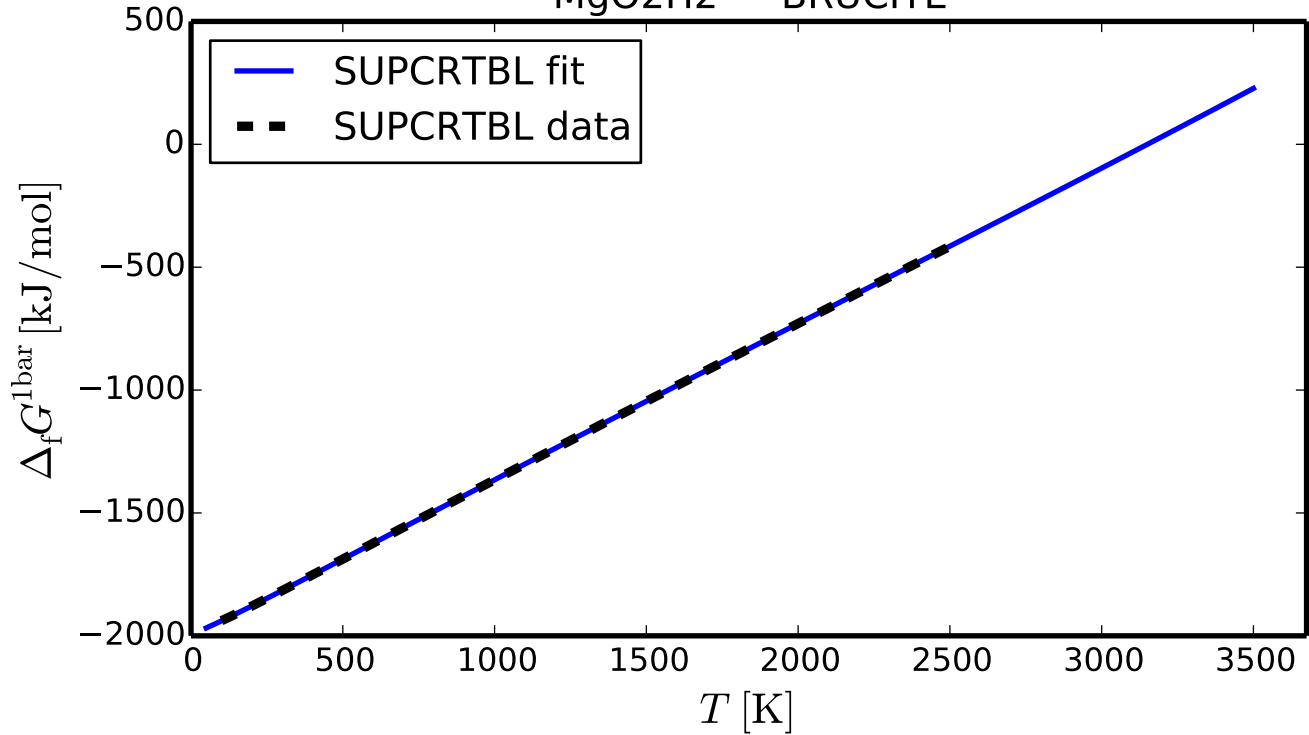
NaAlCO5H2 - DAWSONITE



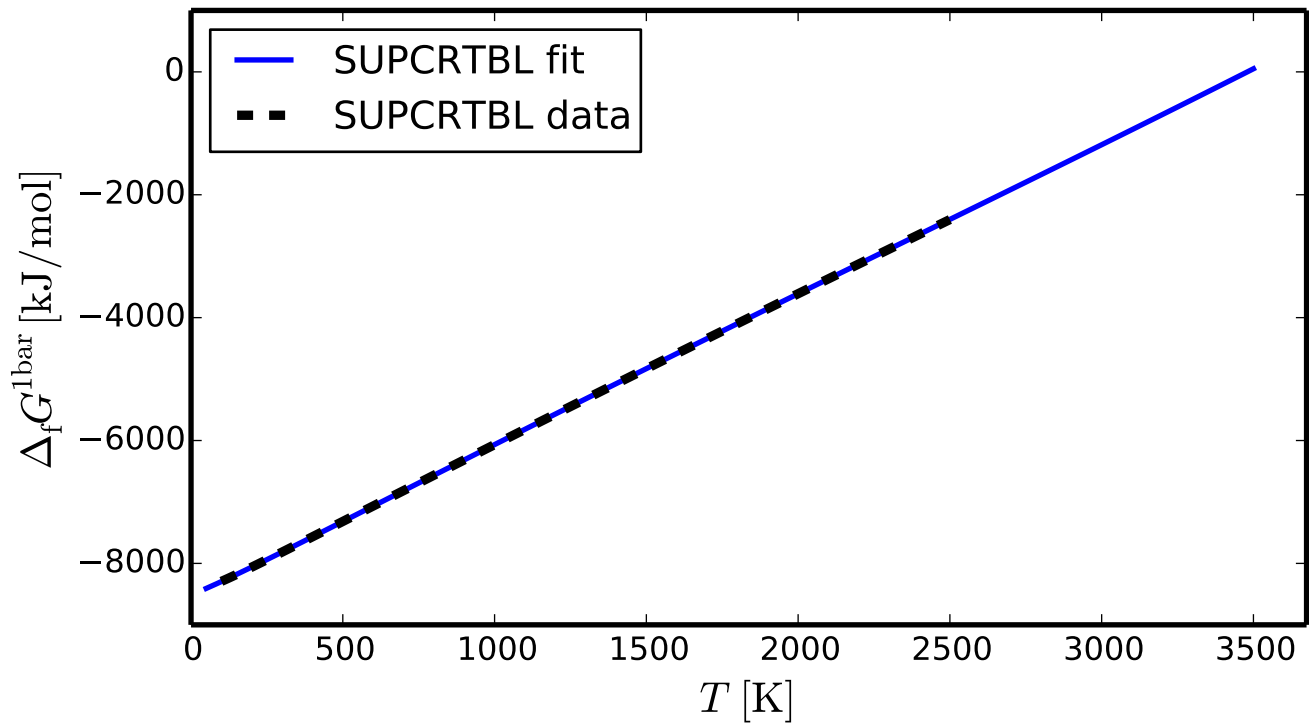
Mn₂O₃ - BIXBYITE



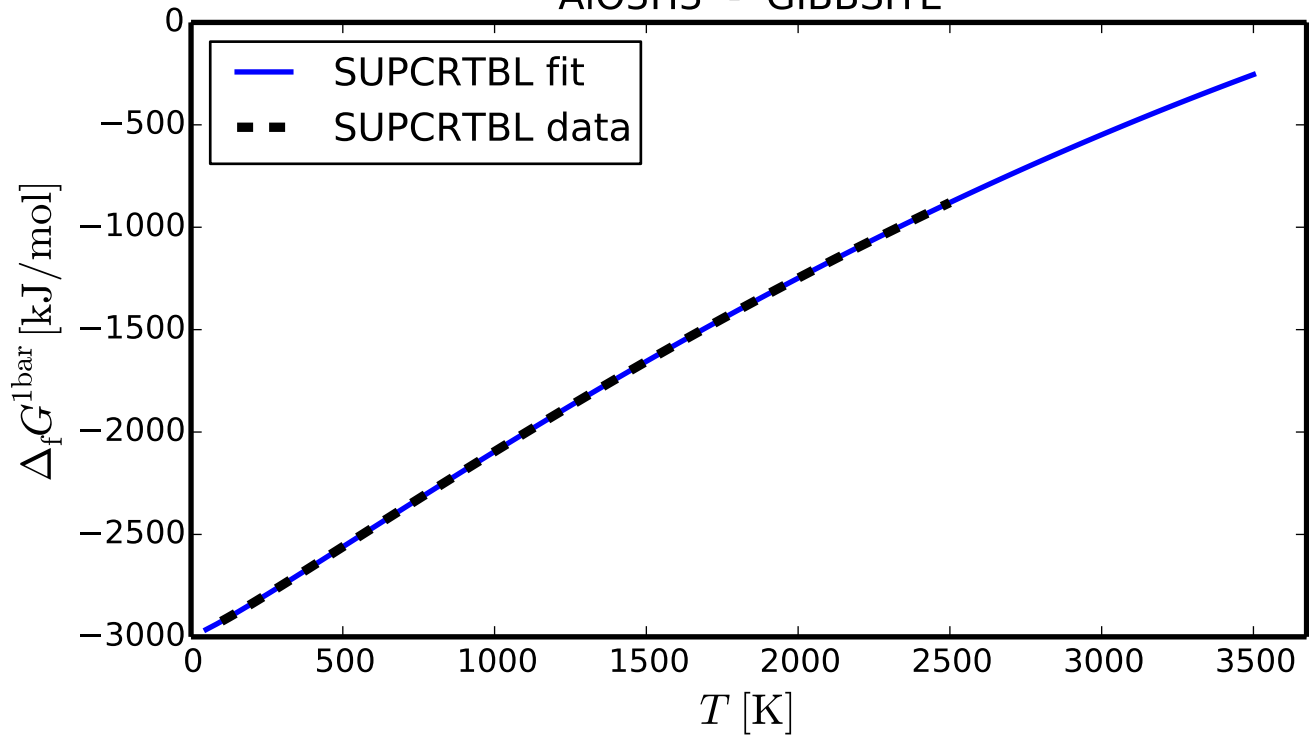
MgO2H2 - BRUCITE



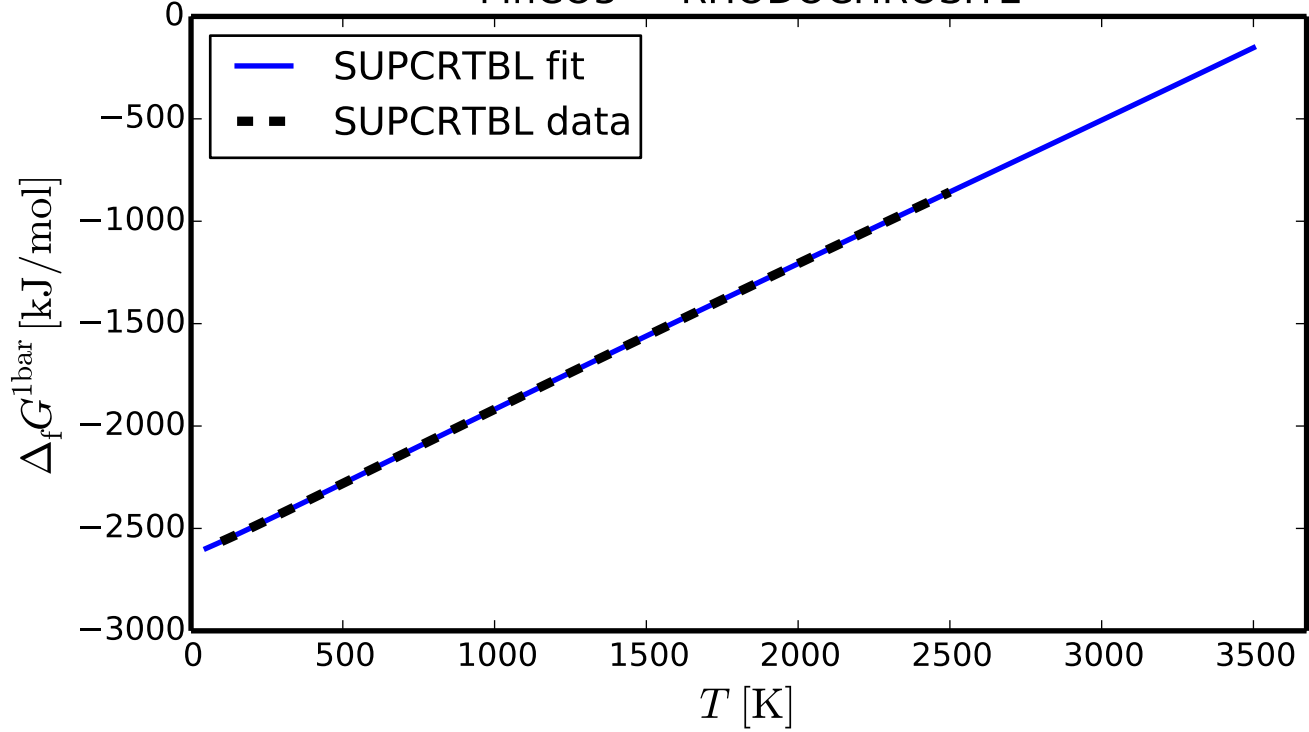
Fe3Si2O9H4 - GREENALITE



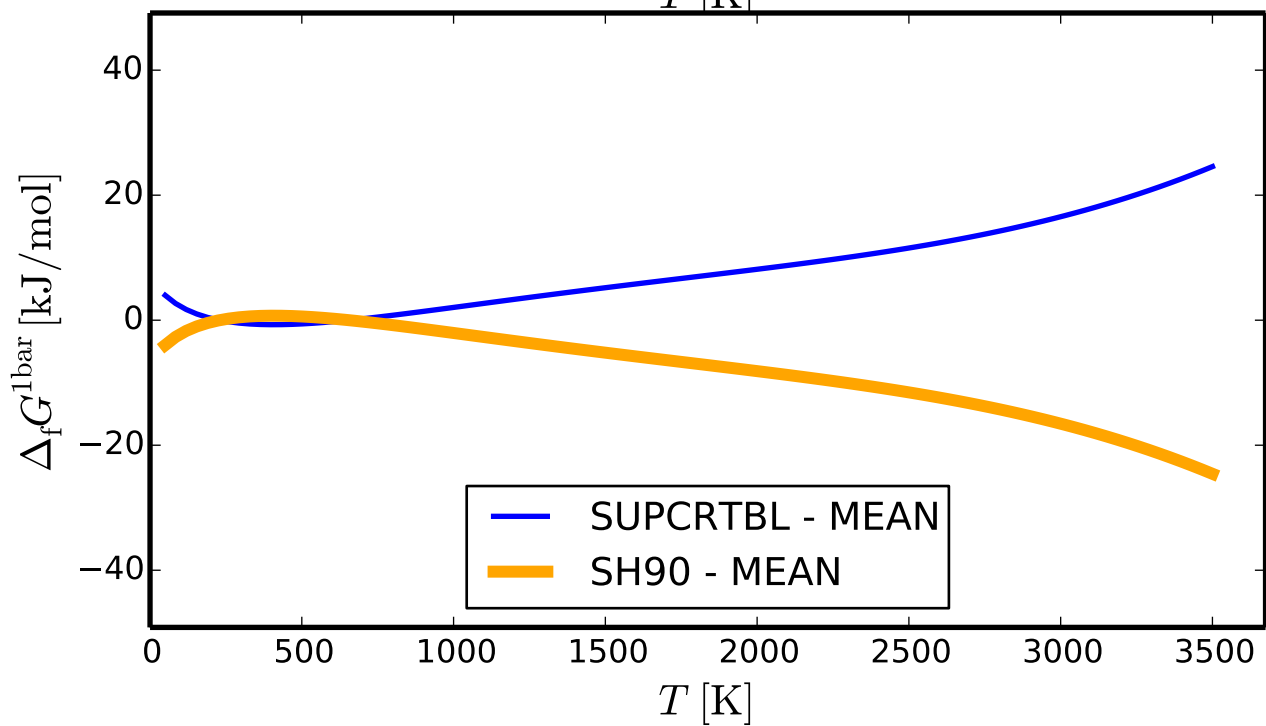
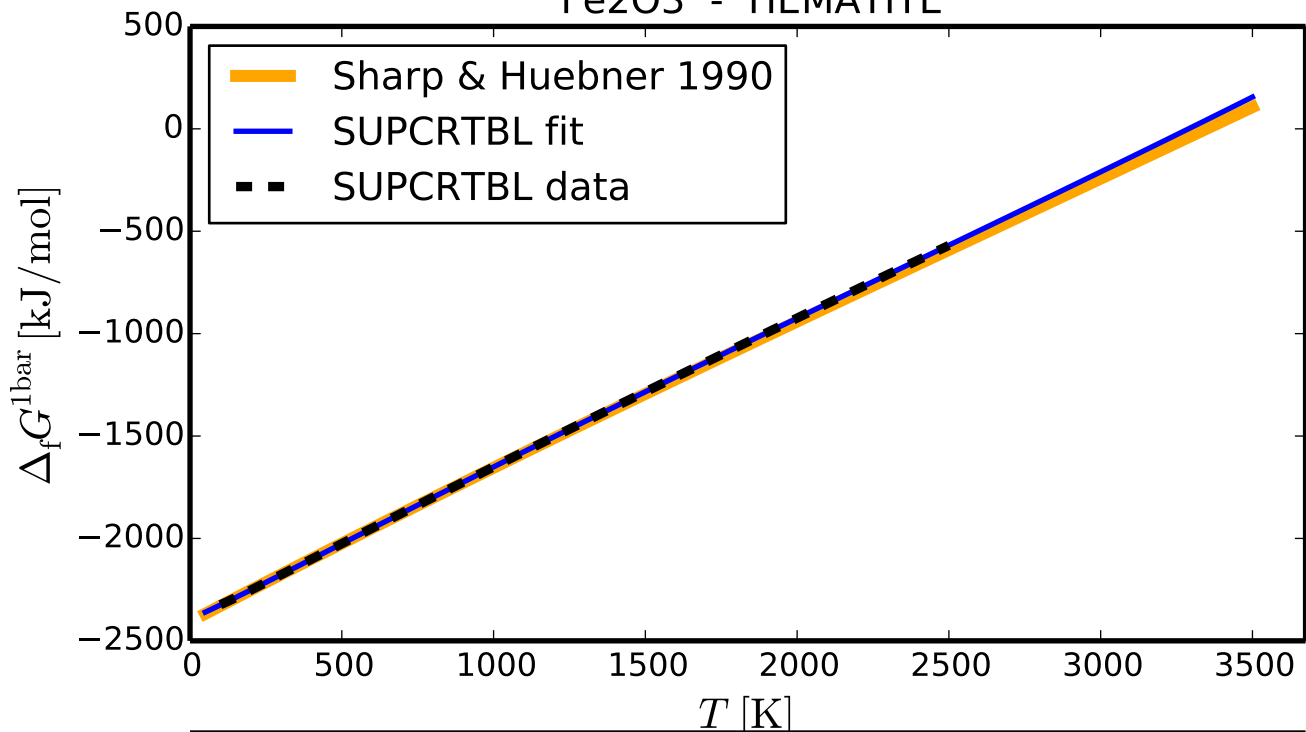
AlO3H3 - GIBBSITE



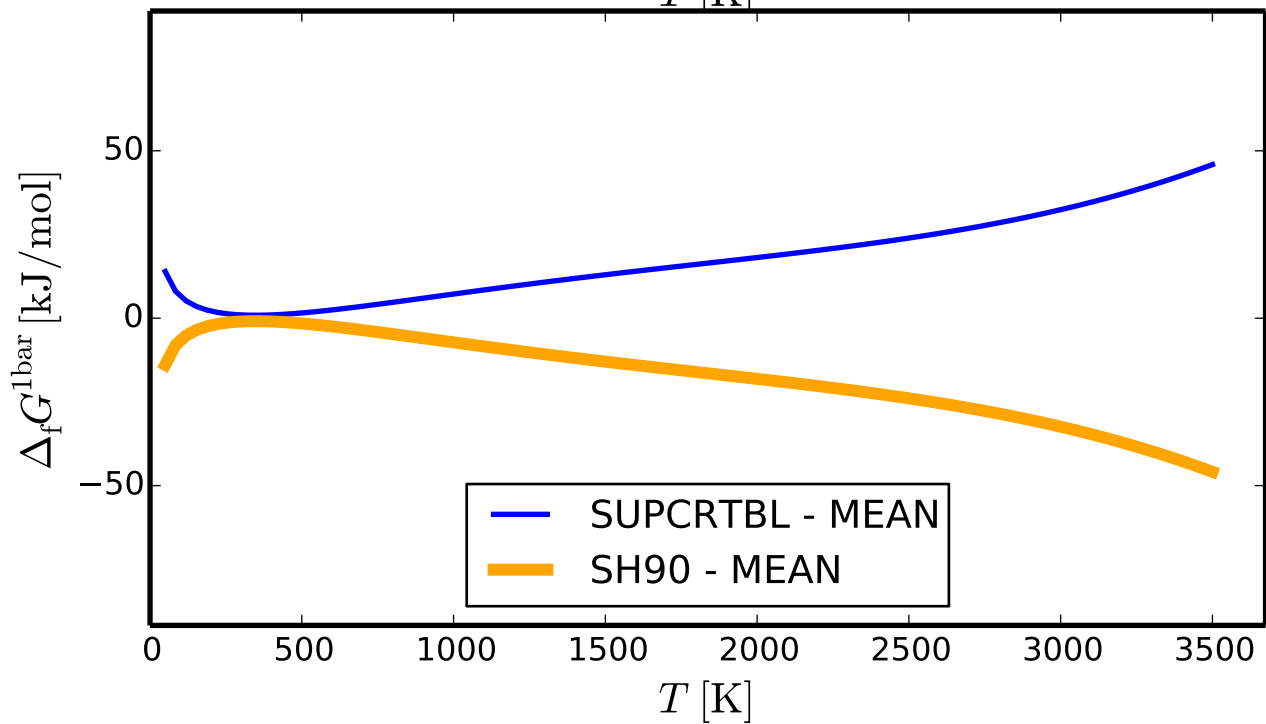
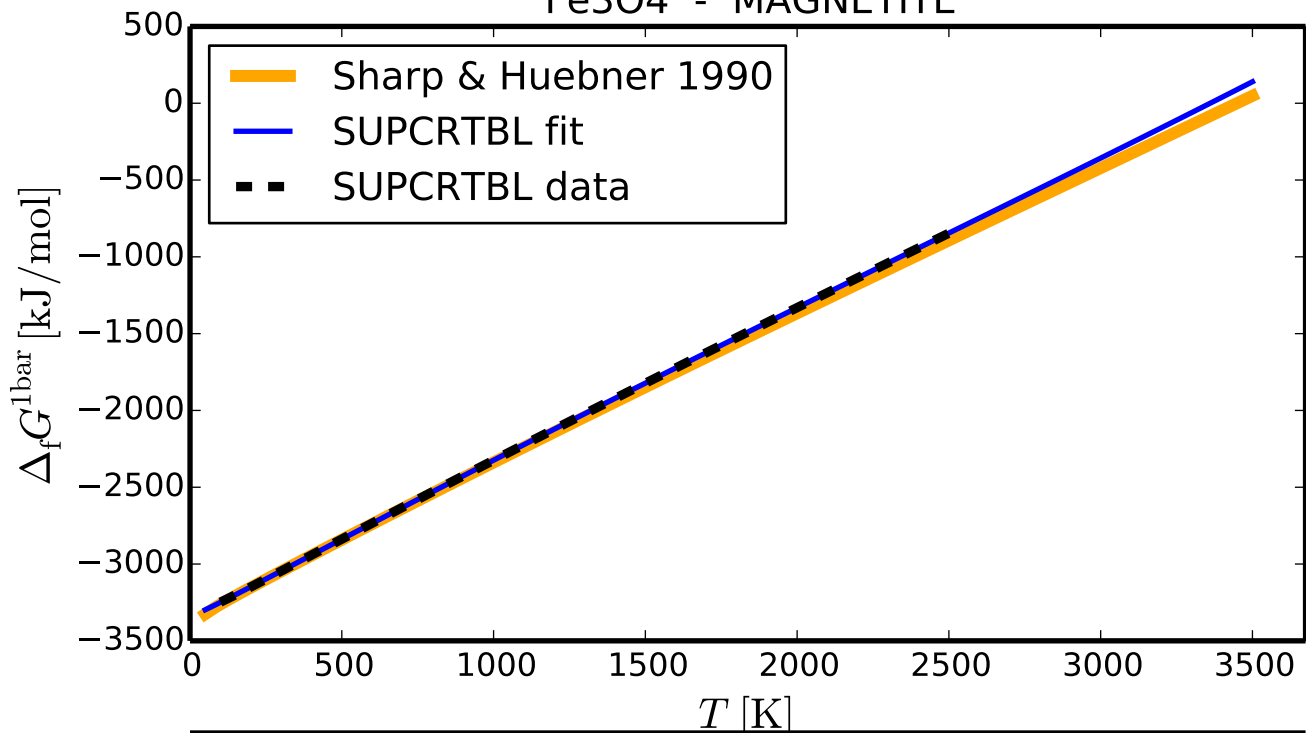
MnCO3 - RHODOCHROSITE



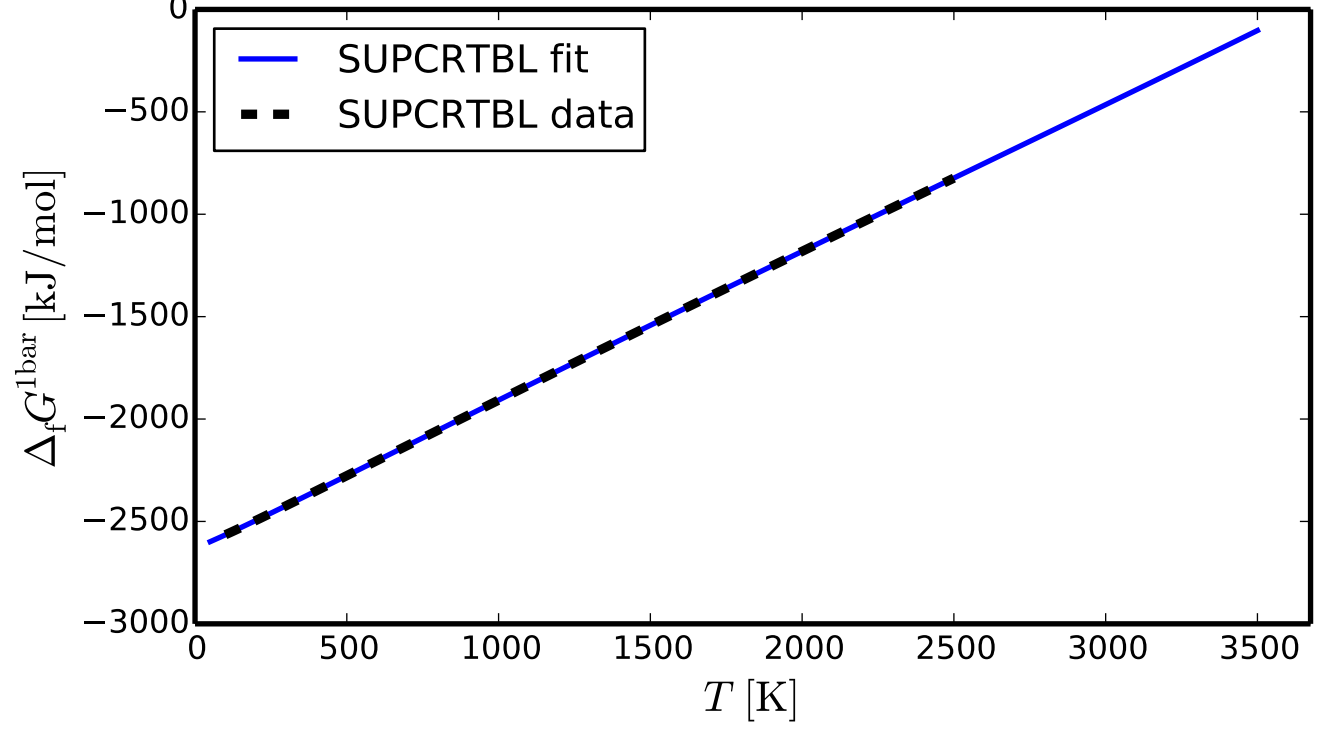
Fe2O3 - HEMATITE



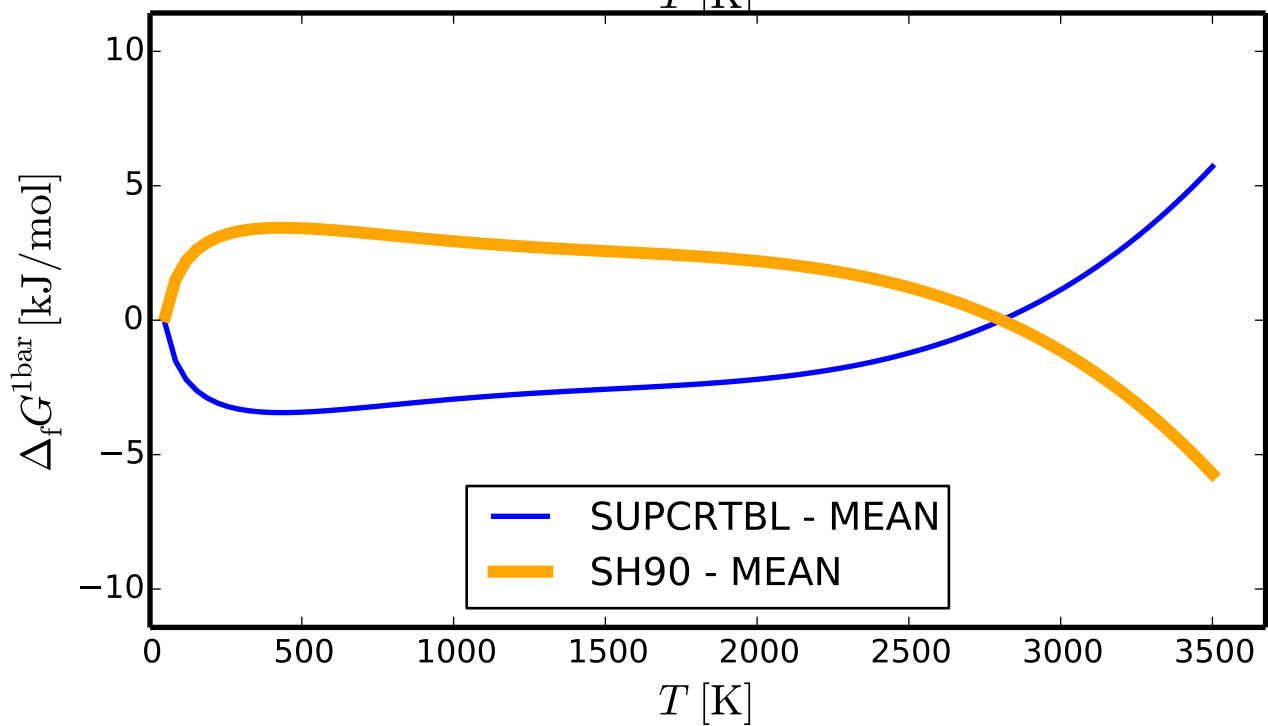
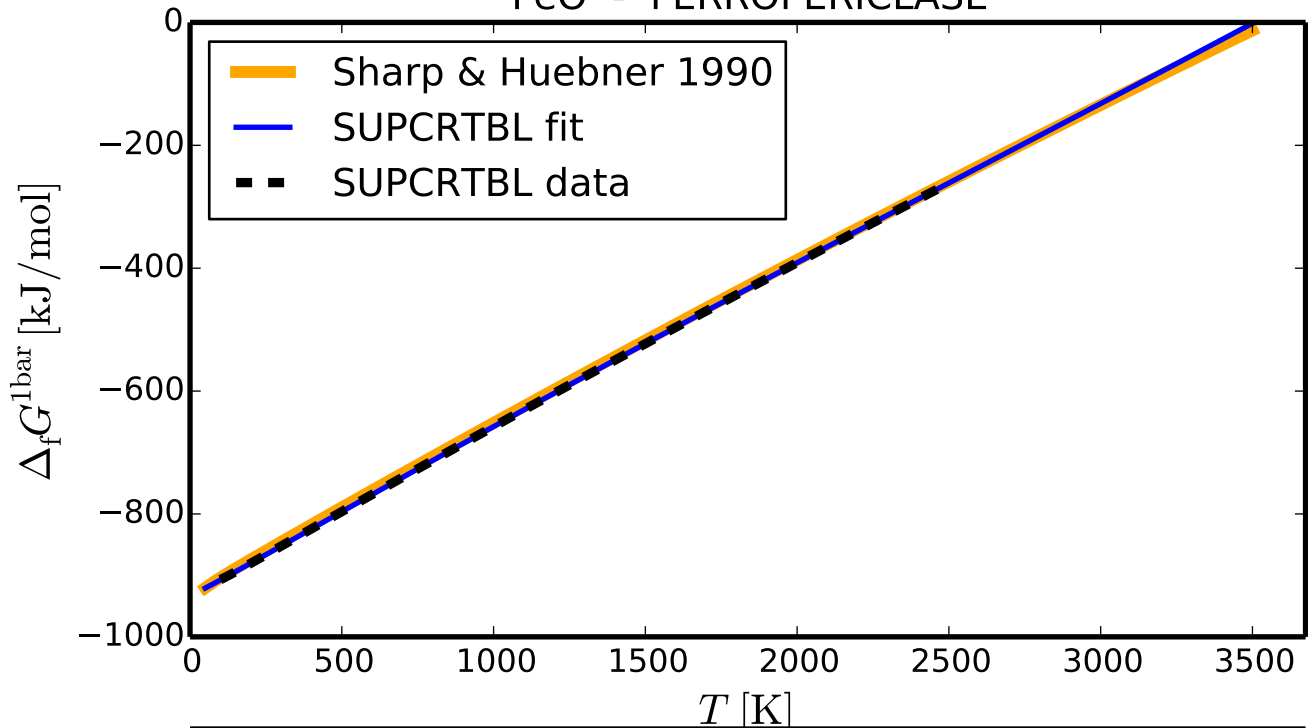
Fe3O4 - MAGNETITE



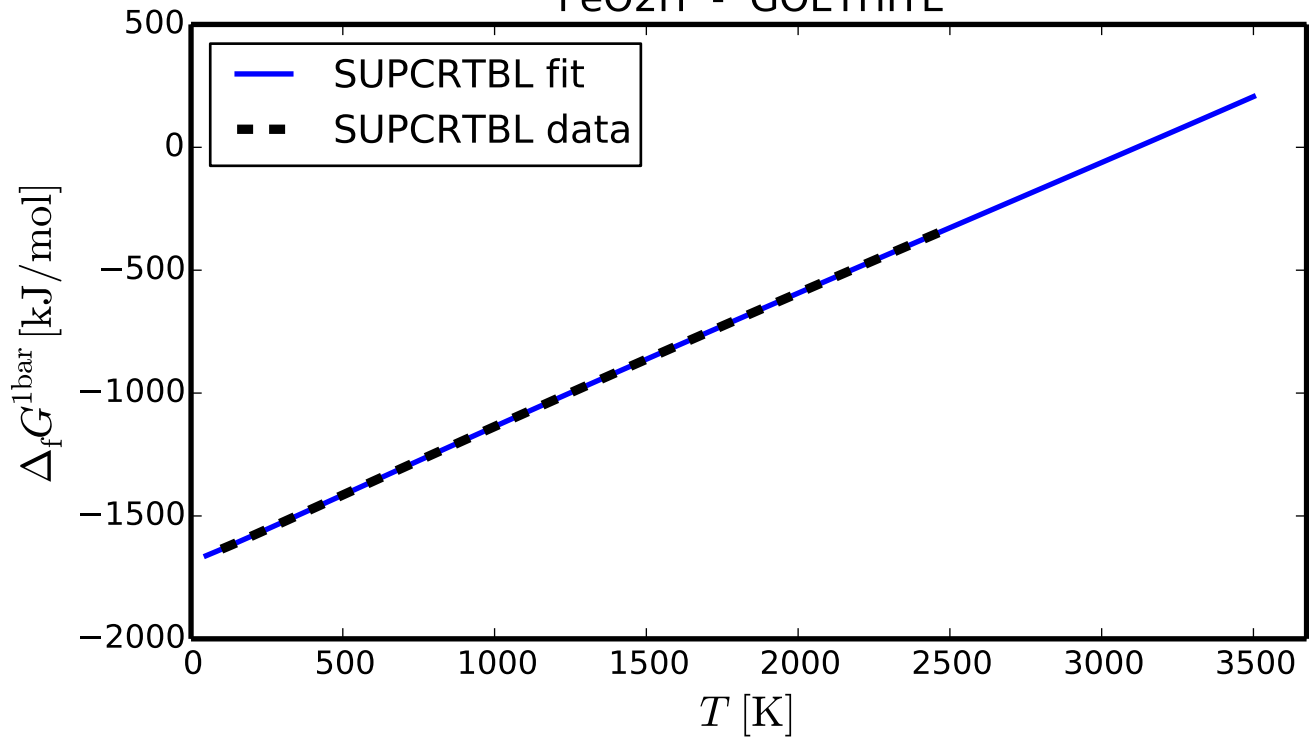
FeCO3 - SIDERITE



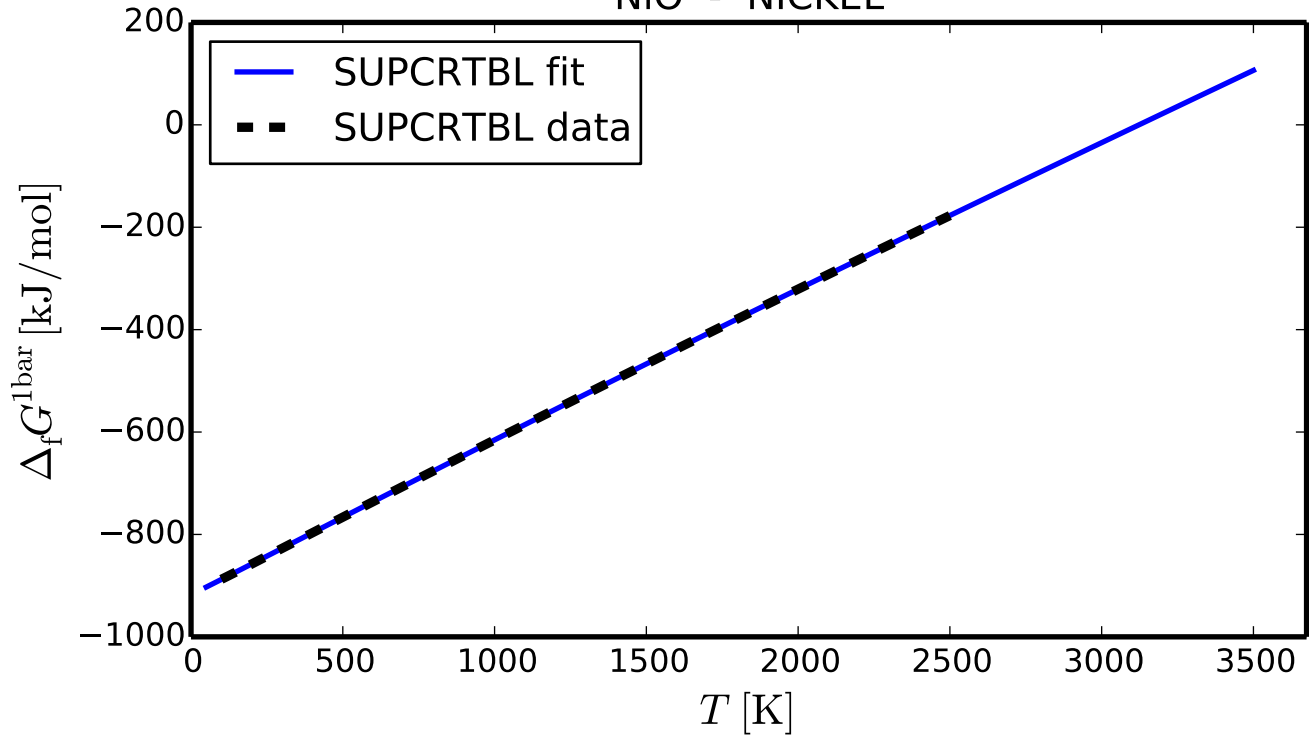
FeO - FERROPERICLASE



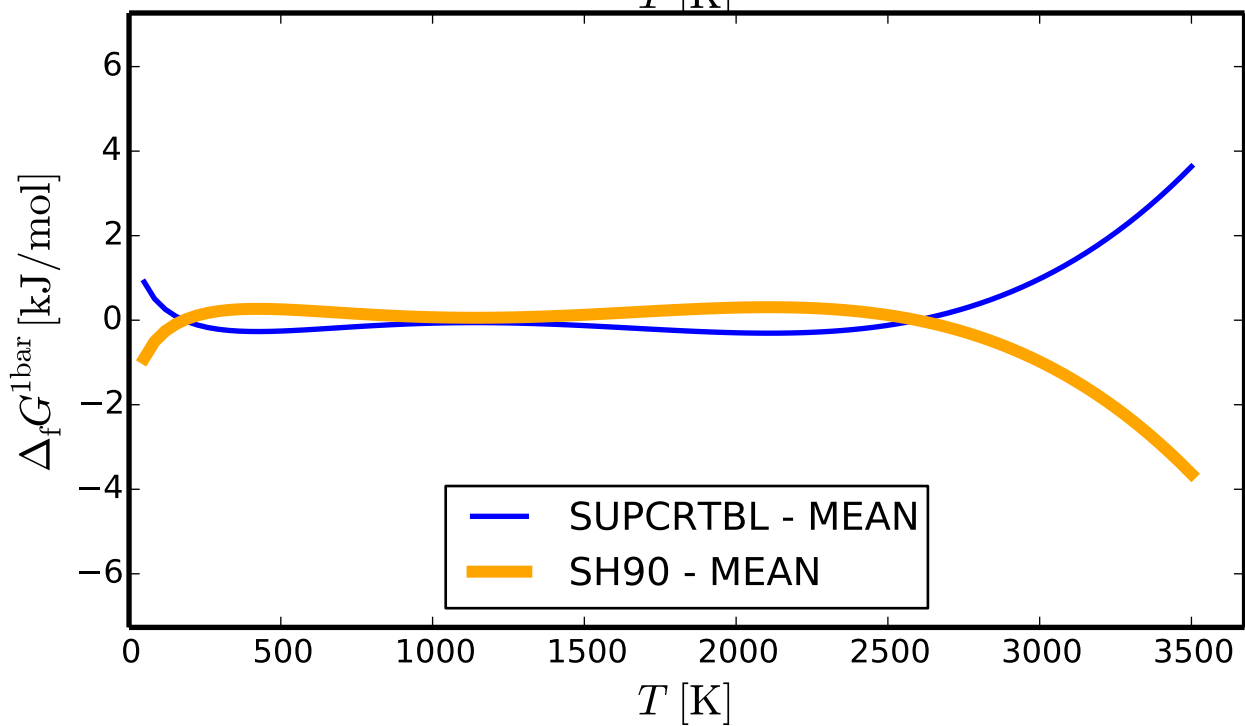
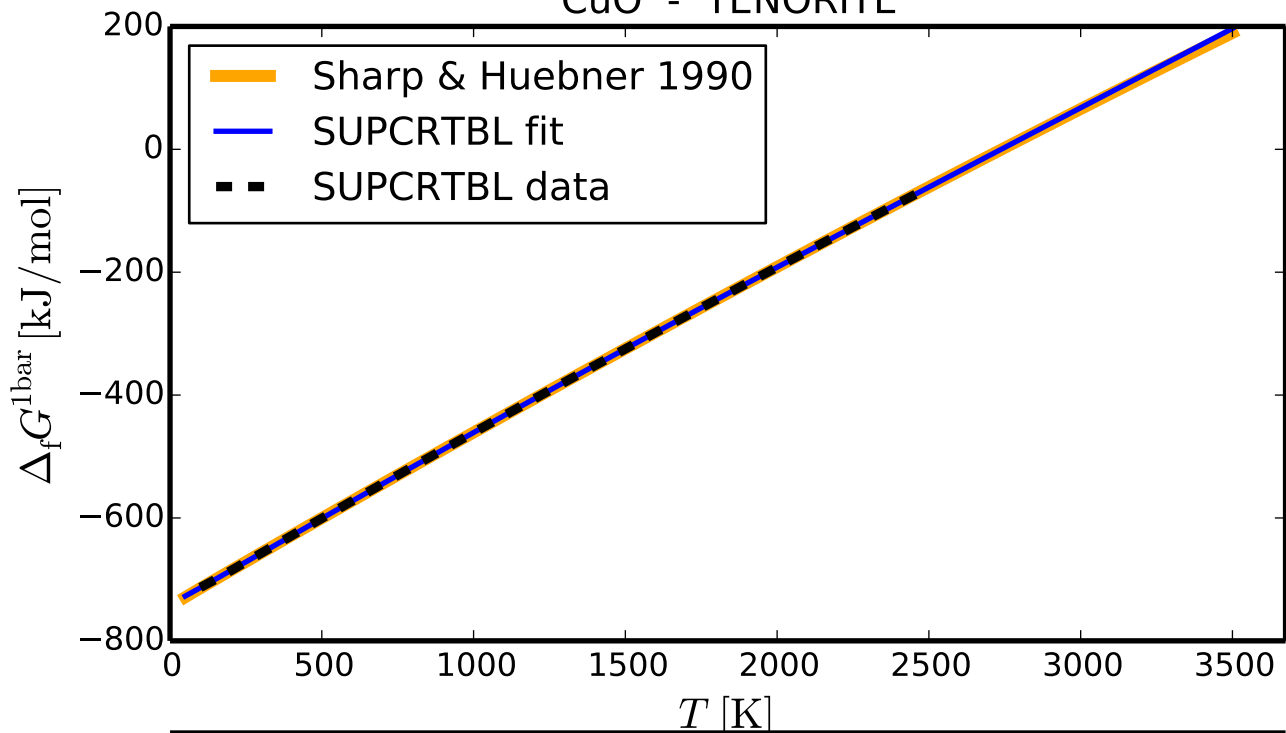
FeO2H - GOETHITE



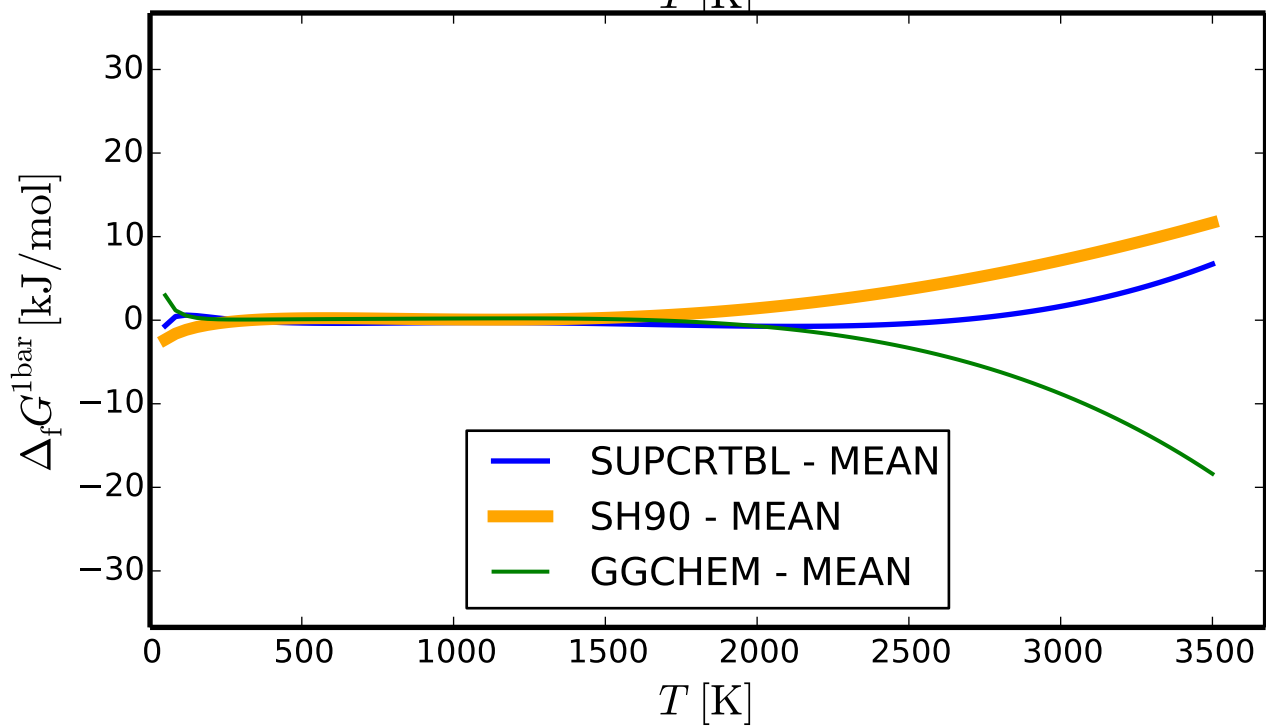
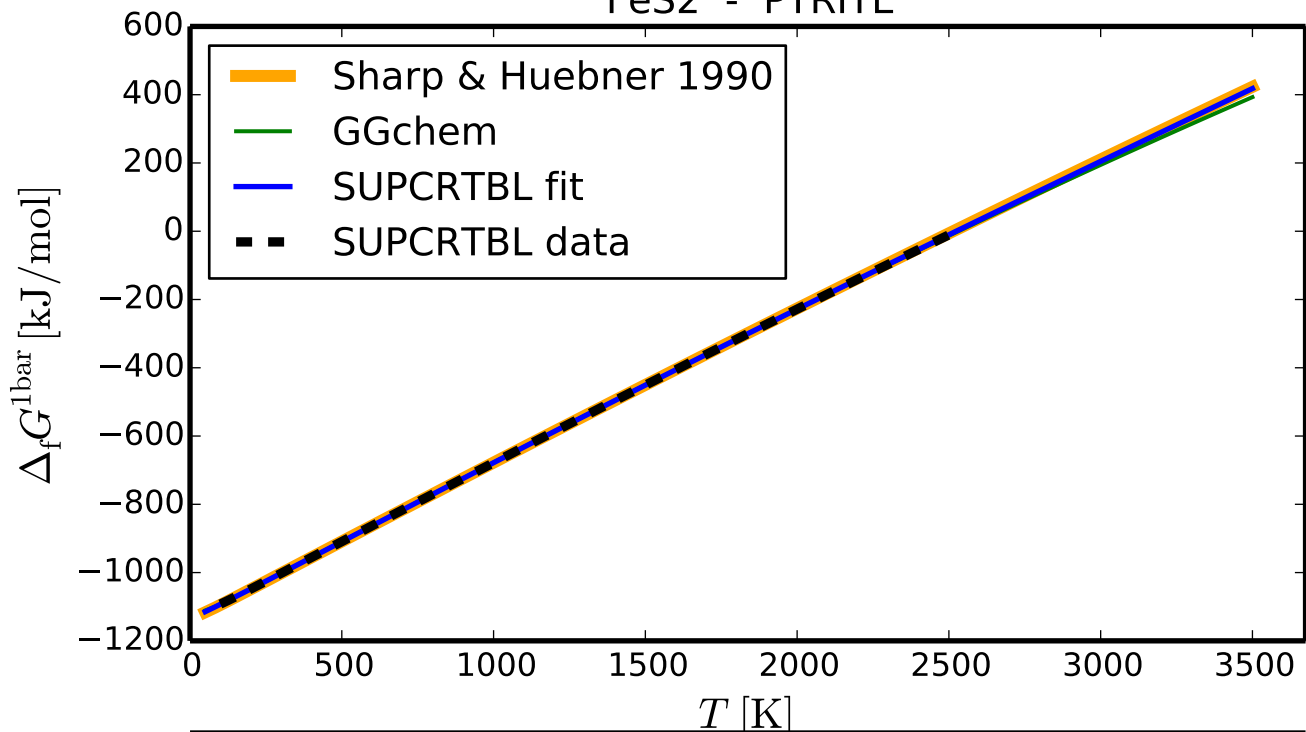
NiO - NICKEL



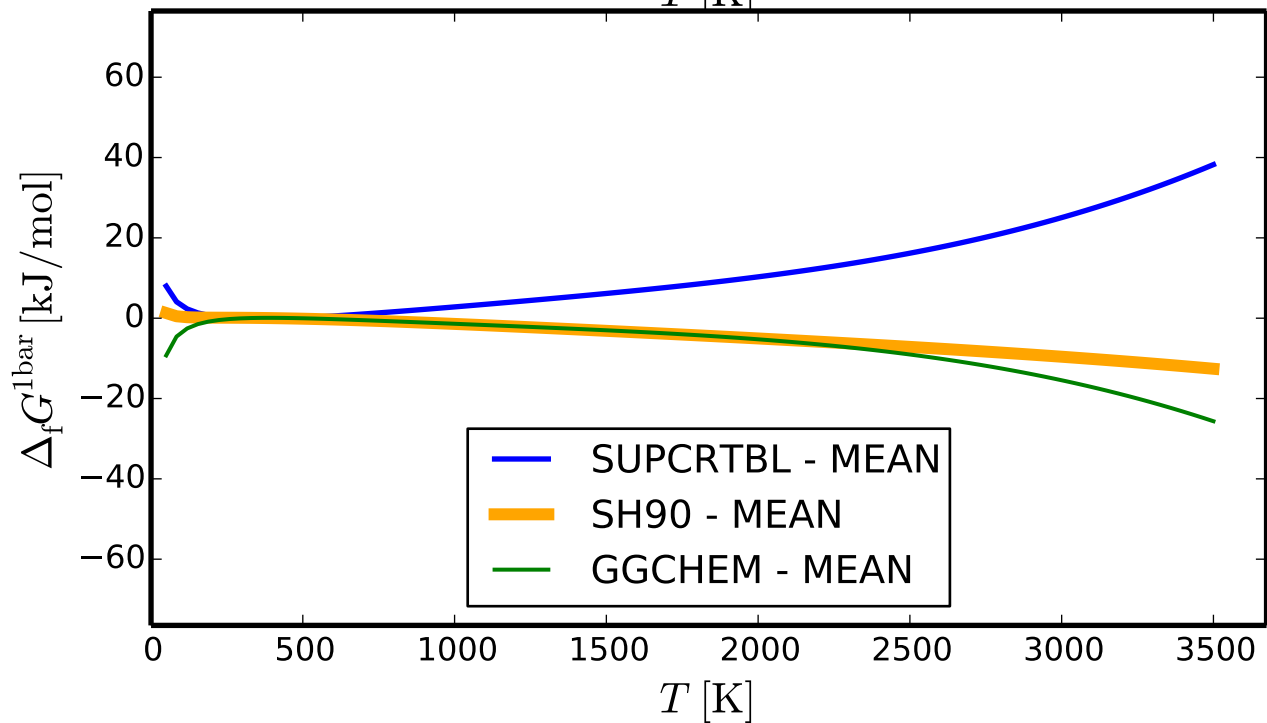
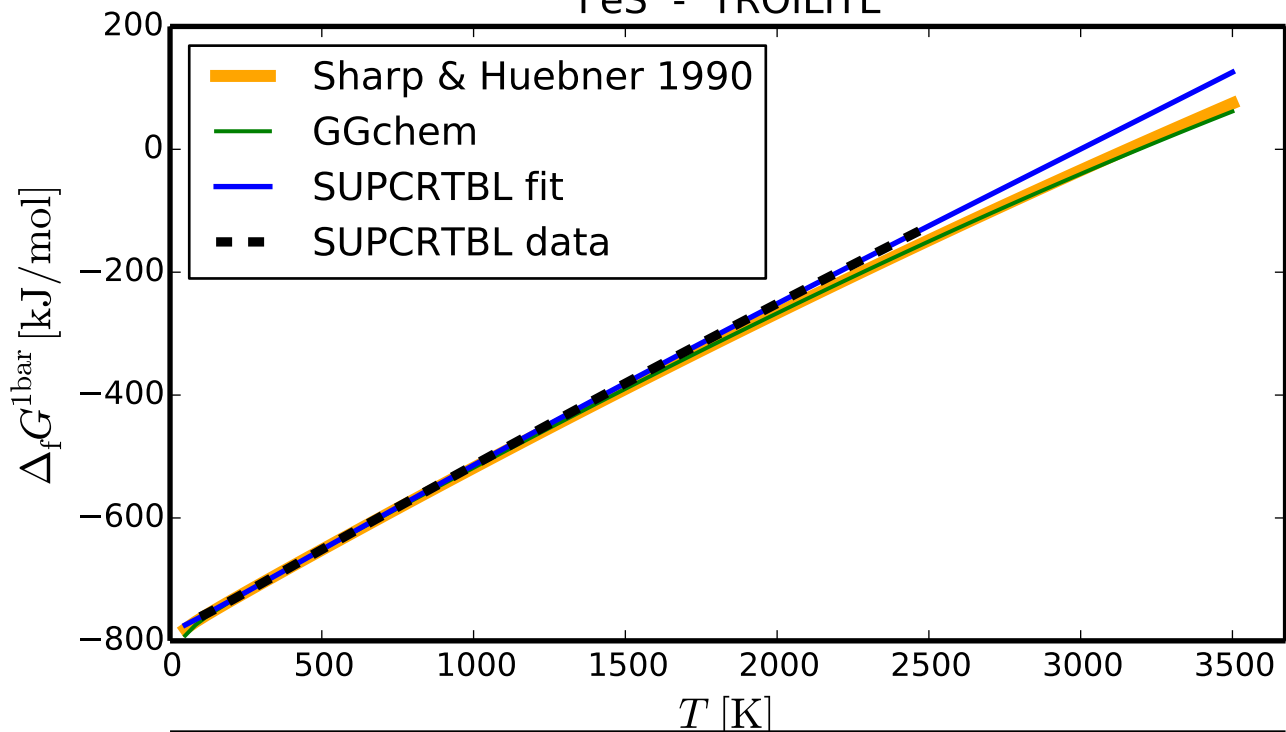
CuO - TENORITE



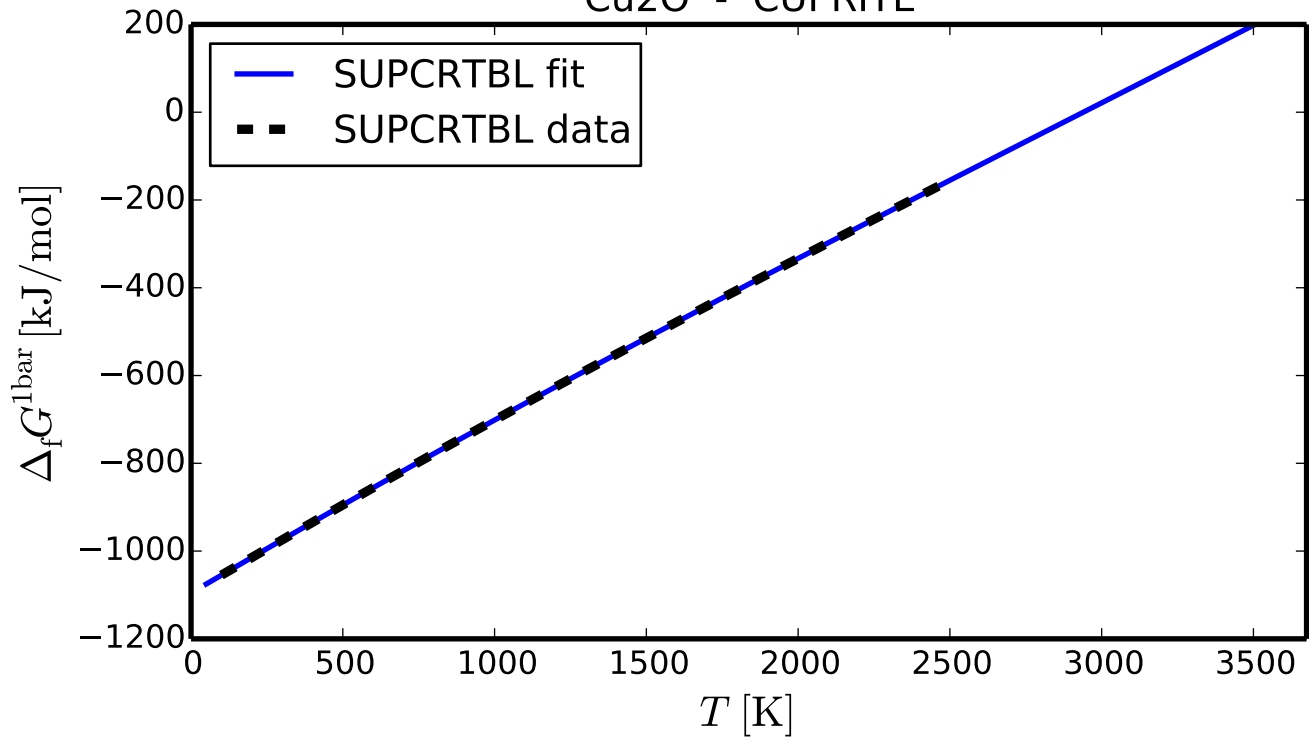
FeS2 - PYRITE



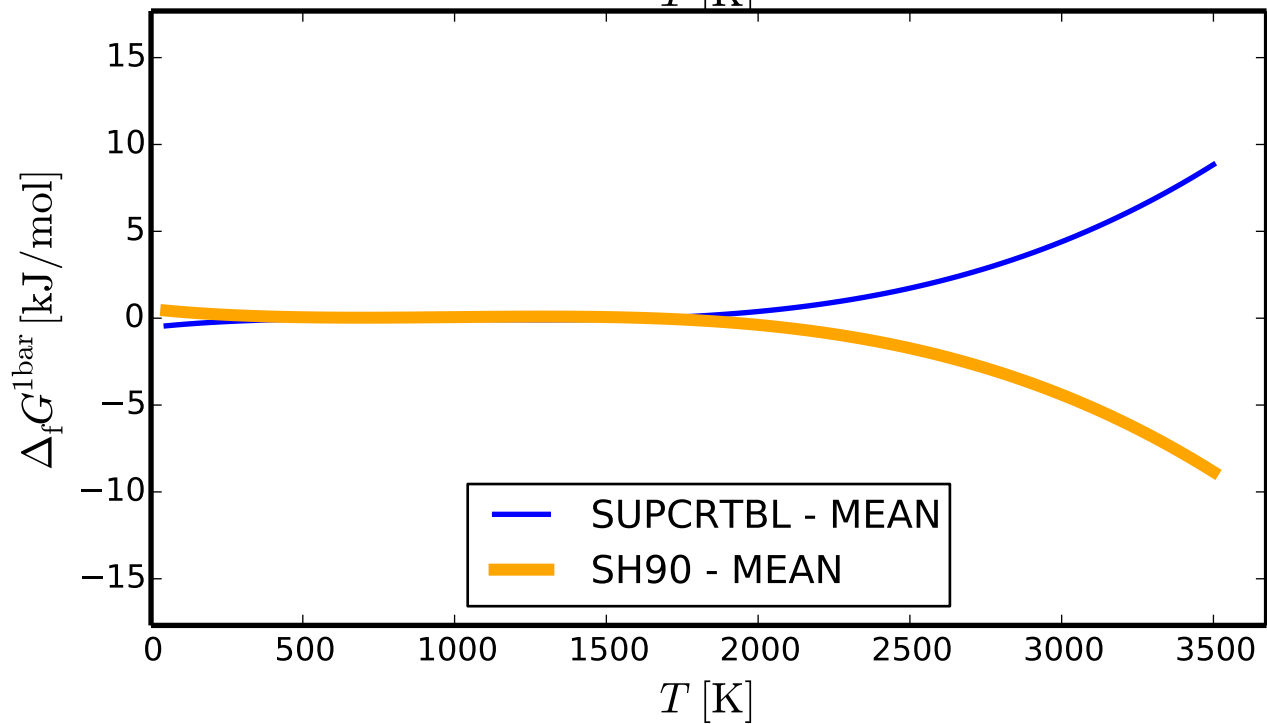
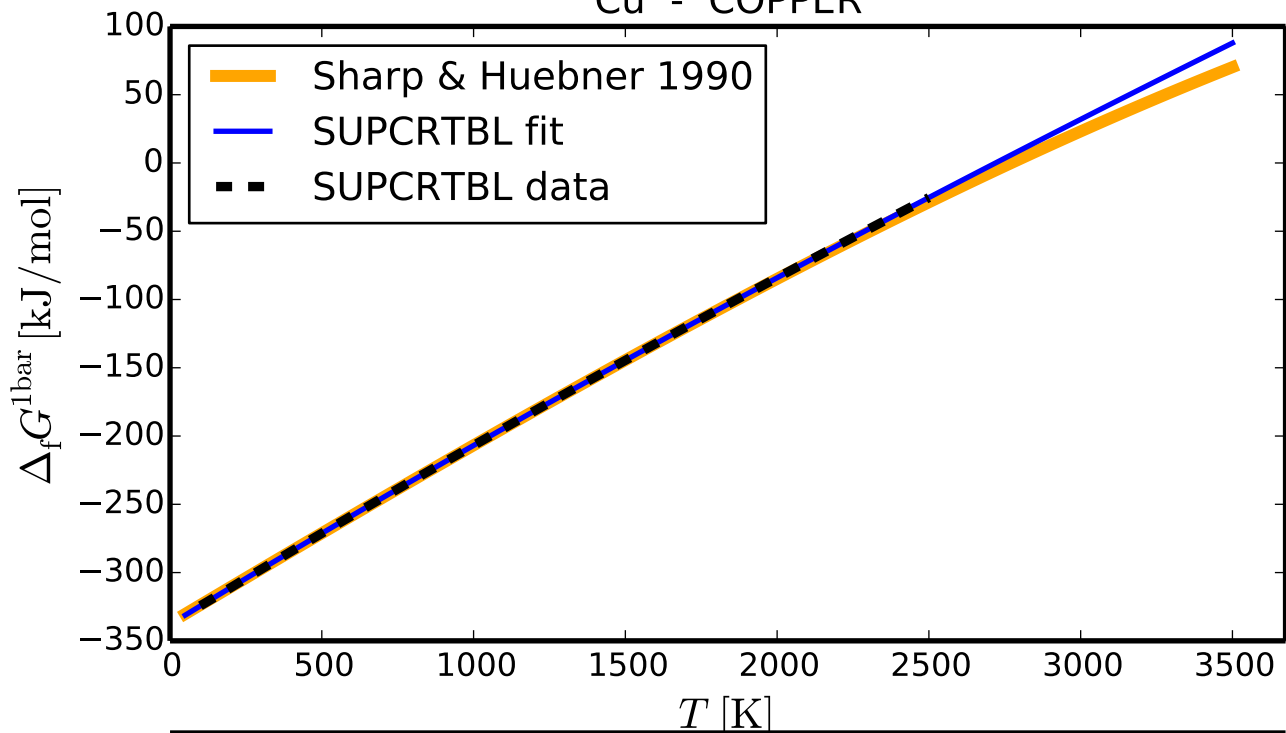
FeS - TROILITE



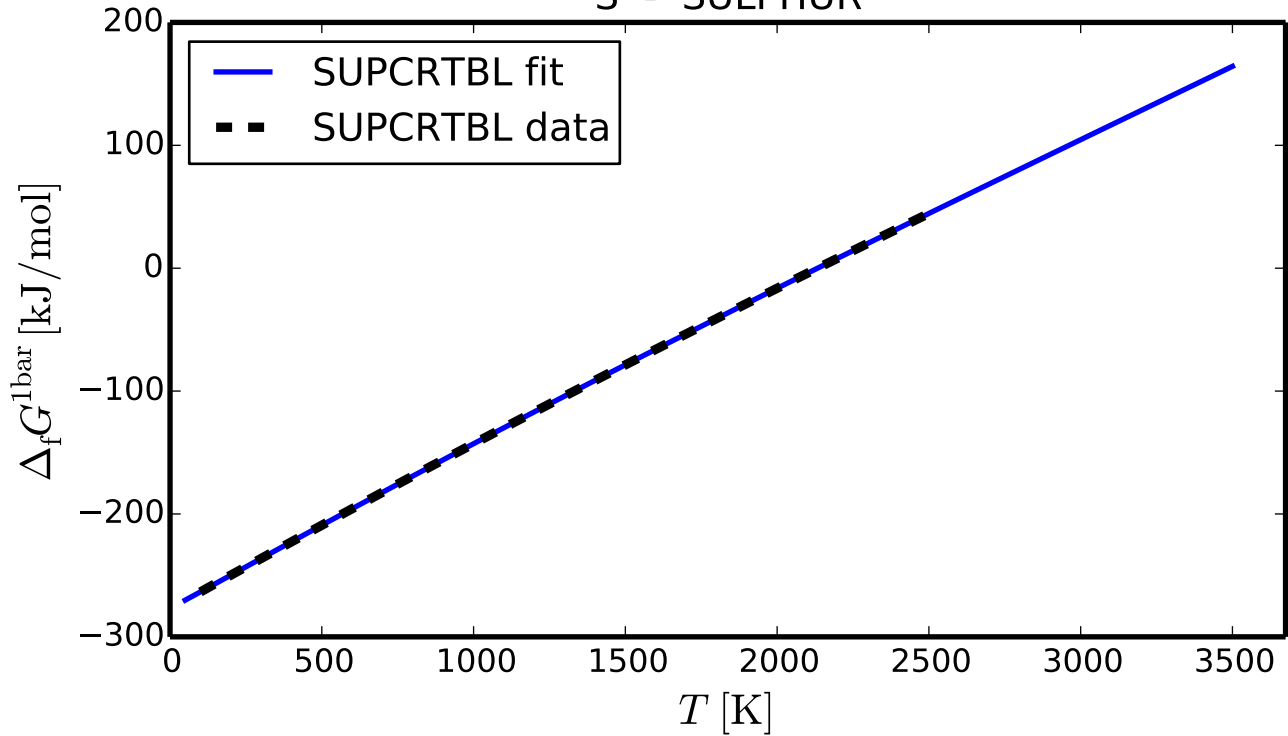
Cu2O - CUPRITE



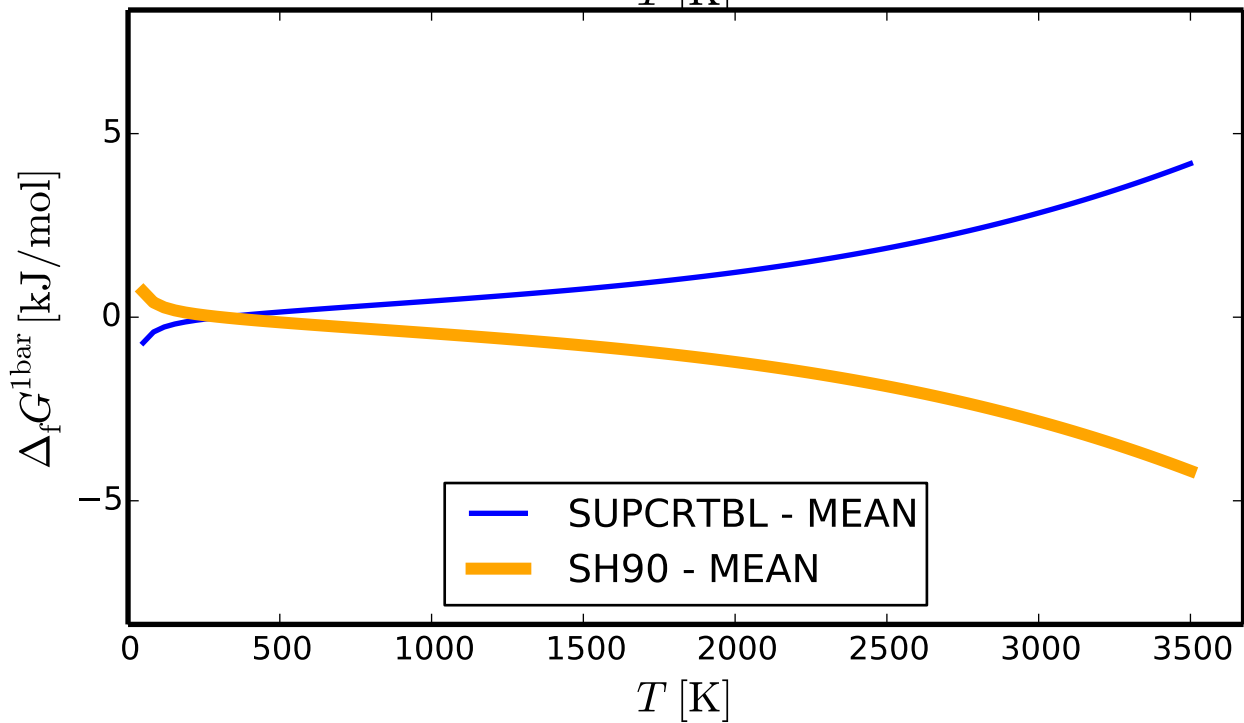
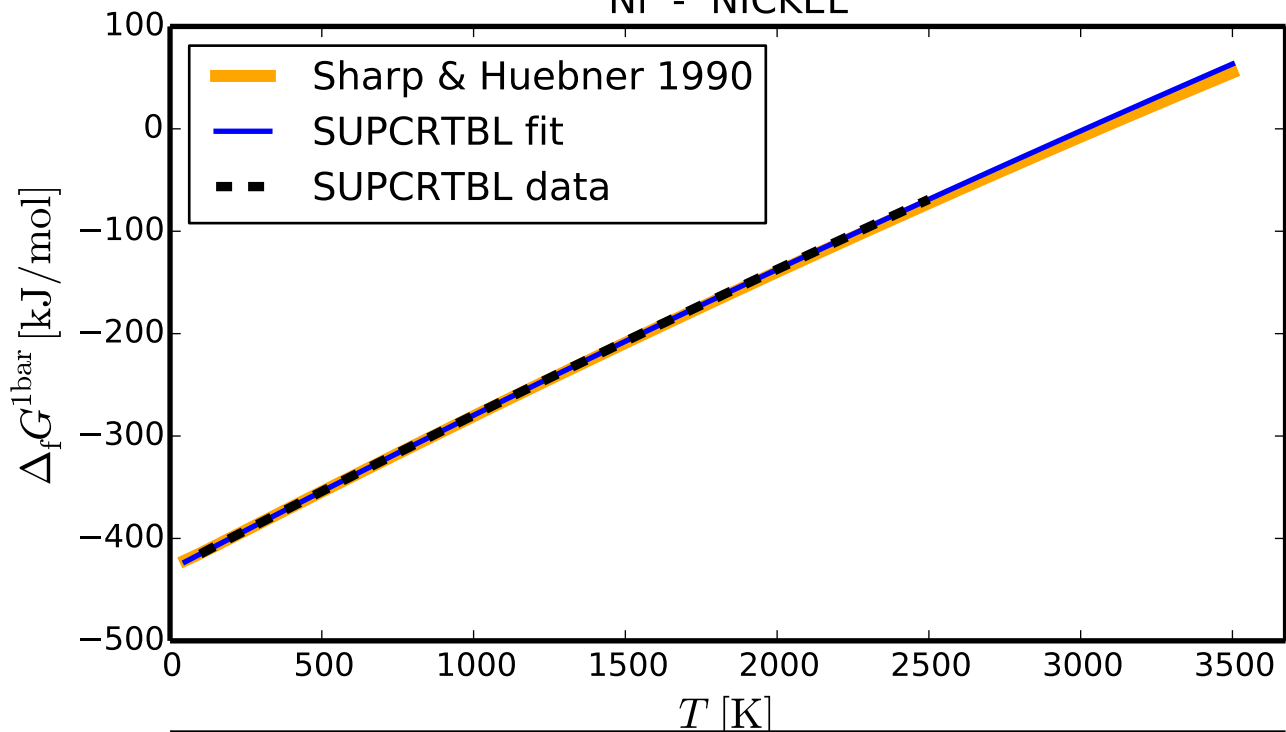
Cu - COPPER



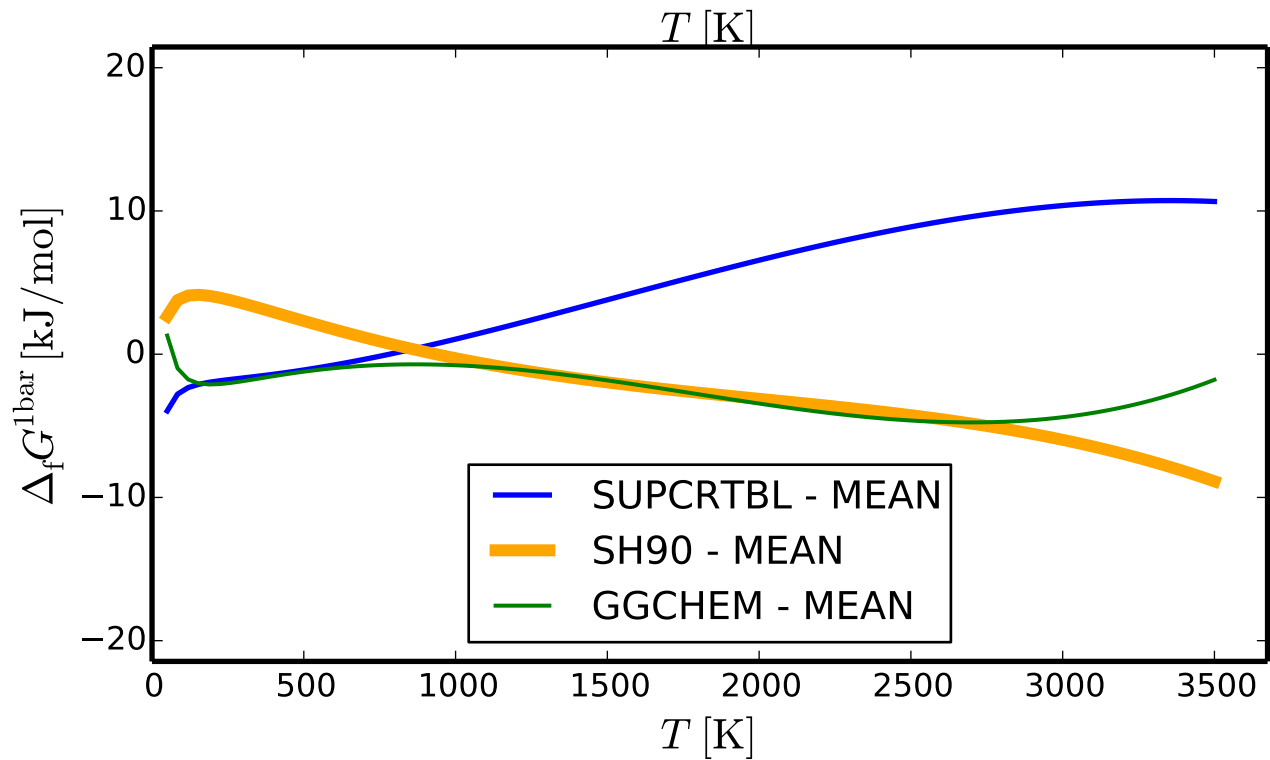
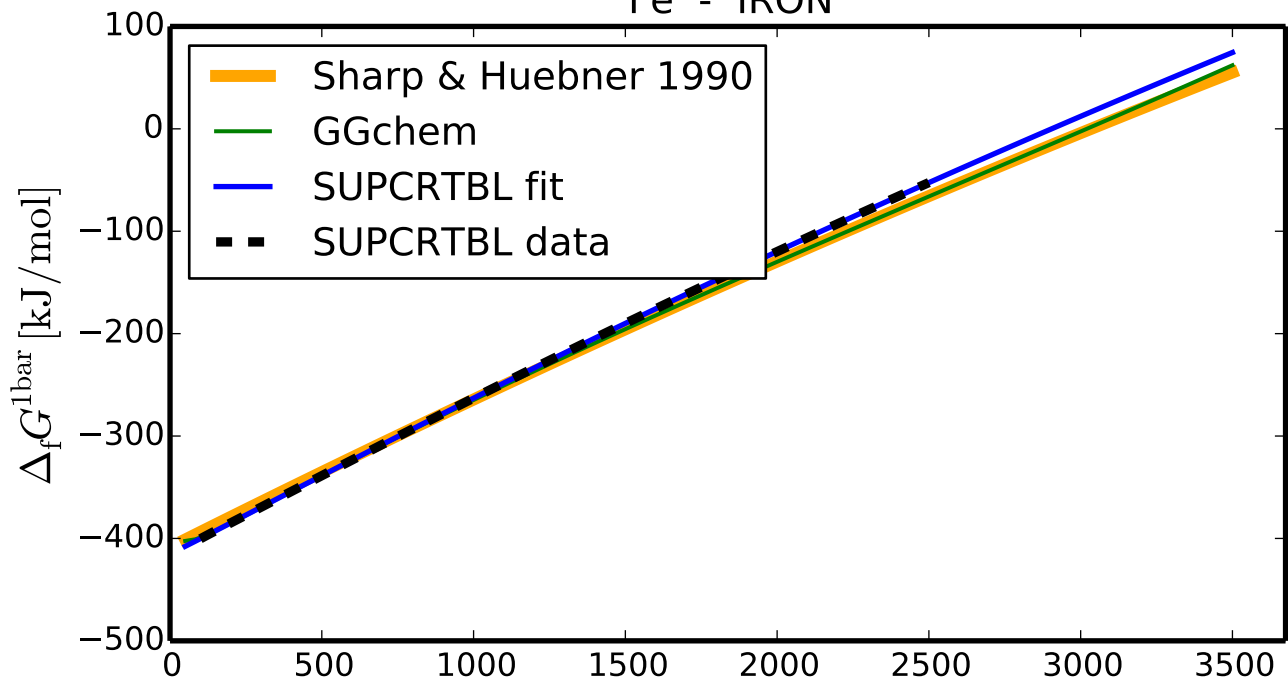
S - SULPHUR



Ni - NICKEL



Fe - IRON



C - GRAPHITE

