Characterize this

IR (HATR) ν in cm^{-1}: 3043.8(m); 1348.0(s); 1004.8(s); 788.2(s); 739.2 (s) 649.2 (s)

Magnetic Susceptibility: χ_g=-5.01*10^{-7}

Vis (H_2O): λ_{max}=647nm (very faint peak); ε=1090.0 $M^{-1}cm^{-1}$; λ_{max}=526nm, ε=8385.8 $M^{-1}cm^{-1}$

H^1 NMR (300 MHz, $CDCl_3$): δ in ppm, 8.76 (8H, pyrrole-H); 7.99 (8H, H-phenyl); 7.63 (12H, H-phenyl); 7.28 ($CDCl_2$-H)

Copper-Tetraphenylporphyrin (provided)

Magnetic Susceptibility: χ_g=7.933*10^{-7}, χ_m=5.388*10^{-4}, χ_a=9.418*10^{-4}, μ_{eff}=1.506

Zinc-Tetraphenylporphyrin (Provided for comparison by another lab pair)

Magnetic Susceptibility: χ_g=-4.01*10^{-8}

Data Analysis:

A comparison of the IR spectra of TPP and Ni-TPP support the notion that the intended reaction occurred. TPP has N-H bonds which result in N-H stretching vibrations. These N-H stretching vibrations tend to occur in the range of 3300-3500 cm^{-1}. In the TPP spectrum, there is a strong peak at 3309.4, which is in the N-H stretch range. There are no peaks with values near 3300-3500 in the Ni-TPP spectrum, with the closest peak at 3043 cm^{-1}. This suggests that the intended replacement of the TPP N-H bonds by coordinate bonds to a nickel core took place. All other peaks of Ni-TPP are similar in frequency range to TPP, suggesting that the expected structural likeness between the TPP and Ni-TPP structures was upheld.

The magnetic susceptibility data reveals information about the nature of the linkage between the metal and the porphyrin complex depending on the metal at the core. The TPP molecule yielded a negative χ_g, which indicates that the substance is diamagnetic, or all of the electrons are paired. This makes sense for this complex because all of the atoms comprising the molecule have the requisite number of bonds to be fully paired (i.e. carbon with four bonds, nitrogen with three bonds) and it is lacking metals which carry d-orbitals with them. The χ_g for Ni-TPP is negative, suggesting that the complex is diamagnetic. Considering that nickel (II) is a d8 metal in a square planar geometry, there are 0 unpaired