1. The Ti(III) oxidation state is rare in terrestrial minerals due to the comparatively highly oxidizing environment on Earth. Trivalent titanium does occur in extraterrestrial materials; one example is a titanium pyroxene found in the Allende meteorite. The empirical formula for this mineral is Ca_{1.01}Mg_{0.38}(Ti^{3+})_{0.34}(Ti^{4+})_{0.14}Al_{0.87}Si_{1.26}O_{5.6}. The crystal structure reveals that this mineral contains chains of edge-shared distorted octahedra with Ti^{3+/4+} ions at the center. The Ti-Ti distance is 3.15 Å. The polarized single-crystal absorption spectra of the Ti^{3+}-Ti^{4+} pyroxene from the Allende meteorite at different pressures are shown below (α and β refer to two different polarization directions).

Propose assignments for the absorption bands at 14,000, 16,000, and 20,000 cm\(^{-1}\) (1 bar). On the basis of your assignments, offer explanations for the pressure dependent behavior of the three bands.