THE ETHANOL-CO\textsubscript{2} DIMER IS AN ELECTRON DONOR-ACCEPTOR COMPLEX

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Supercritical (sc) CO\textsubscript{2} is a common industrial solvent for the extraction of caffeine, nicotine, petrochemicals, and natural products. The ability of apolar scCO\textsubscript{2} to dissolve polar solutes is greatly enhanced by the addition of a polar co-solvent, often methanol or ethanol. Experimental and theoretical work show that methanol interactions in scCO\textsubscript{2} are predominantly hydrogen bonding, while the gas-phase complex is an electron donor-acceptor (EDA) configuration. Ethanol, meanwhile, is predicted to form EDA complexes both in scCO\textsubscript{2} and in the gas phase, but there have been no experimental measurements to support this conclusion. Here, we report a combined chirped-pulse and cavity FTMW study of the ethanol-CO\textsubscript{2} complex. Comparison with theory indicates the EDA complex is dominant under our experimental conditions. We confirm the structure with isotopic substitution, and derive a semi-experimental equilibrium structure. Our results are consistent with theoretical predictions that the linearity of the CO\textsubscript{2} subgroup is broken by the complexation interaction.