TO KINK OR NOT: THE SEARCH FOR LONG CHAIN CUMULENONES USING MICROWAVE SPECTRAL TAXONOMY

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Although cumulene carbenes terminated with sulfur up to H_2C_7S are known to possess C_{2v} geometries, the analogous oxygen species have only been characterized in the gas-phase up to H_2C_4O, and propadienone (H_2C_3O) and butatrienone (H_2C_4O) exhibit kinked heavy atom backbones. Using microwave spectral taxonomy, searches have been undertaken for pentatetrenone (H_2C_5O) and its isomers. Surprisingly, no evidence has been found for the cumulenone, but rotational lines of a bent-chain isomer, $HC(O)C_4H$, analogous in structure to propynal, HC(O)CCH, have been detected instead. In closely-related work, the sulfur analog $HC(S)C_4H$ has also been identified for the first time. This talk will provide a summary of our search procedure and experimental findings, quantum chemical calculations of isomeric stability and dipole moments, and prospects for detecting these longer chains in astronomical sources where c-C_3H_2O and HC(O)CCH are known.