STRUCTURAL DETERMINATION OF THE LINEAR SILICON-CARBON CHAINS SIC_4 AND SIC_6

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Silicon-carbon chains and rings are of astronomical interest since SiC, SiC_2, rhomboidal SiC_3, and linear SiC_4 have all been detected in the circumstellar shell of the evolved carbon star IRC+10216. We have now detected and characterized in the laboratory the rotational spectra of four new linear silicon carbides from SiC_5 to SiC_8. Molecules were formed by an electrical discharge in a supersonic molecular beam and detected by Fourier-transform microwave spectroscopy. For several of these molecules, lines are sufficiently strong that a number of rare isotopic species have been found as well. Experimental substitution structures for SiC_4 and SiC_6 have been determined by fitting the bond lengths to the derived moments of inertia of the isotopic species. Agreement between predicted and observed bond lengths indicates that the bonding in these molecules is cumulenic, i.e. that the bonding is characterized by a series of double bonds.