Real time study of IR photodissociation of trisilane and thiirane mixtures producing polycarbosilthiane films.

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Infrared laser chemistry, introduced about three decades ago, makes possible many specific chemical reactions that cannot be achieved by other means [1]. IR laser chemistry of trisilane in mixtures with other laser radiation absorbing compounds is accomplished by tuning radiation to one or both compounds and it allows new gas-phase chemistry leading to novel solid structures deposited from the gas phase [2].

In this work we present our study of the IR laser irradiation of trisilane in mixtures with thiirane and show that simultaneous decomposition of both compounds results in chemical vapour deposition of carbosilthiane polymers. The progress of the decomposition of both compounds is followed by FTIR spectroscopy and gas chromatography-mass spectroscopy. Laser Induced Fluorescence (LIF) experiments proved the transit occurrence of SiS in the gas phase. The formation of this species is supported by the detection of two LIF excitation spectra in two different UV spectral regions corresponding to the $E^1\Sigma^+$—$X^1\Sigma^+$ and $D^1\Pi$—$X^1\Sigma^+$ systems and also to their respective lifetimes. An abundant and whitish deposit is obtained in all cases which is studied by "in situ" FTIR spectroscopy. The deposited films evolve hydrogen sulphide and change their spectral pattern when exposed to air. The morphology of these films is inspected by scanning electron microscopy (SEM). The identification of transient formation of SiS and final volatile and solid decomposition products allows us draw plausible scheme of the co-decomposition process [3].

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