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The electronic spectrum of silicon monotelluride radical

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Abstract. In the electronic spectrum of silicon monotelluride which has been produced in microwave discharges through sealed tubes, a large number of new bands belonging to the $A^1\Pi$–$X^1\Sigma^+$ system (3100–3900 Å) and the $E^1\Sigma^+$–$X^1\Sigma^+$ system (2800–3100 Å) of $Si^{130}Te$ has been observed. The vibrational structure analyses of these band systems have resulted in the determination of improved vibrational constants in all the three electronic states involved in these transitions. An error in the previous determination of the vibrational constants of the $E^1\Sigma^+$ state has been corrected. An upper limit for the dissociation energy of the silicon monotelluride has been determined to be 40,000 cm^{-1}.

Keywords. Electronic spectrum; SiTe radical.

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1. Introduction

Barrow (1939) and Vago and Barrow (1946a, b) investigated the electronic spectrum of the silicon monotelluride (SiTe) in which they identified two band systems: $A^1\Pi$–$X^1\Sigma^+$ (3100–3900 Å) and $E^1\Sigma^+$–$X^1\Sigma^+$ (2800–3100 Å). Bosser and Lebreton (1983) carried out the rotational analysis of a few bands belonging to the A–X system. We have been investigating the electronic spectra of ten valence electron diatomic systems: SiO, SiS, SiSe and SiTe. We have recently undertaken the study of the emission spectrum of the SiTe radical under moderate as well as high resolutions. During these studies we have recorded the A–X and E–X bands of the isotopic radical $Si^{130}Te$. We have been able to identify a number of new bands belonging to these band systems. A close scrutiny of their vibrational structure revealed that the vibrational constants determined by Vago and Barrow (1946b) $E^1\Sigma^+$ state are in error. The present investigation of the vibrational structure of these band systems has resulted in the determination of improved vibrational constants. These results are reported in this communication.

2. Experimental details

While Vago and Barrow (1946b) have obtained the absorption spectrum of SiTe by preparing the silicon monotelluride in situ by a chemical process, Bosser and Lebreton (1983) produced its emission spectrum in a Schuler type of hollow cathode discharge tube. These methods require gramme quantities of silicon and tellurium. Since the expensive enriched isotopes are available only in milligram quantities, neither