



Publication Year	2017
Acceptance in OA @INAF	2020-09-15T14:51:41Z
Title	Zeeman Effect in Sulfur Monoxide: a Probe to Observe Magnetic Fields in Star Forming Regions?
Authors	Cazzoli, Gabriele; Lattanzi, Valerio; Coriani, Sonia; Gauss, Jürgen; CODELLA, CLAUDIO; et al.
DOI	10.15278/isms.2017.TF09
Handle	http://hdl.handle.net/20.500.12386/27381

ZEEMAN EFFECT IN SULFUR MONOXIDE: A PROBE TO OBSERVE MAGNETIC FIELDS IN STAR FORMING REGIONS?

GABRIELE CAZZOLI, *Dep. Chemistry 'Giacomo Ciamician', University of Bologna, Bologna, Italy*; VALERIO LATTANZI, *The Center for Astrochemical Studies, Max-Planck-Institut für extraterrestrische Physik, Garching, Germany*; SONIA CORIANI, *Department of Chemistry, Technical University of Denmark, Kgs. Lyngby, Denmark*; JÜRGEN GAUSS, *Institut für Physikalische Chemie, Universität Mainz, Mainz, Germany*; CLAUDIO CODELLA, *Arcetri Observatory, INAF, Florence, Italy*; ANDRÉS ASENSIO RAMOS, *Instituto de Astrofísica de Canarias, Instituto de Astrofísica de Canarias, La Laguna, Spain*; JOSE CERNICHARO, *Molecular Astrophysics, ICMC, Madrid, Spain*; CRISTINA PUZZARINI, *Dep. Chemistry 'Giacomo Ciamician', University of Bologna, Bologna, Italy*.

Magnetic fields play a fundamental role in star formation processes and the best method to evaluate their intensity is to measure the Zeeman effect of atomic and molecular lines. However, a direct measurement of the Zeeman spectral pattern from interstellar molecular species is challenging due to the high sensitivity and high spectral resolution required. So far, the Zeeman effect has been detected unambiguously in star forming regions for very few non-masing species, such as OH and CN. We decided to investigate the ability of sulfur monoxide (SO), which is one of the most abundant species in star forming regions, for probing the intensity of magnetic fields via Zeeman effect. The Zeeman effect for several rotational transitions of SO in the (sub-)mm spectral regions has been investigated by using a frequency-modulated, computer-controlled spectrometer, and by applying a magnetic field parallel to the radiation source. To support the experimental determination of the g factors of SO, a systematic quantum-chemical investigation of these parameters for both SO and O₂ has been carried out. An effective experimental-computational strategy for providing accurate g factors as well as for identifying the rotational transitions showing the strongest Zeeman effect has been presented. Our investigation supports SO as a good candidate for probing magnetic fields in high-density star forming regions.