

NEW DATASET FOR MOLECULAR IONS OF ASTROPHYSICAL IMPORTANCE

Veljko Vujčić¹, Vladimir A. Srećković², Radoslav
Zamanov³ and Darko Jevremović¹

¹*Astronomical Observatory, Volgina 7, 11060 Belgrade 38, Serbia*

²*Institute of Physics Belgrade, Pregrevica 118,
11080, Belgrade, Serbia*

³*Institute of Astronomy, Bulgarian Academy of Sciences,
72 Tsarigradsko Chaussee Blvd., 1784 Sofia, Bulgaria*

E-mail: veljko@aob.rs, vlada@ipb.ac.rs

Atomic and molecular (A&M) datasets, databases and data ecosystems are gaining increasing importance for diagnostics, creation of models and simulations of complex physical processes, and interpretation of data provided by measurements (Marinkovic et al., 2017). A&M data can be used to model and comprehend stellar processes, including nucleosynthesis, radiation, and the formation of complex molecules in space, and also in the interstellar medium (Snow, T. P. & McCall, B. J. (2006)). Precision spectroscopy of molecular ions has applications in astrochemistry, quantum state controlled chemical reactions, and measurements of fundamental constants (Vazquez-Carson et al., 2022; Brown et al., 2016). Such accurate spectroscopy measurements open the path for search for astrophysical presence of small molecules like SiH⁺, CaH⁺, etc. We investigated optical (photodissociative) processes involving calcium monohydride ions, and collected

cross section dataset for the range of parameters which cover modeling of abovementioned environments.

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References

Brown, K. R., Khanyile, N. B., Rugango, R., Shu, G., & Calvin, A., Single Molecular Ion Spectroscopy: Towards Precision Measurements on CaH^+ . 2016, in 71st International Symposium on Molecular Spectroscopy, TD09.

Marinkovic, B. P., Bredehoft, J., Vujčić, V., Jevremović, D., & Mason, N., Rosetta Mission: Electron Scattering Cross Sections-Data Needs and Coverage in BEAMDB Database. 2017, *Atoms*, 5, 46

Snow, T. P., & McCall, B. J. (2006). Diffuse atomic and molecular clouds. *Annu. Rev. Astron. Astrophys.*, 44, 367-414.

Vazquez-Carson, S. F., Sun, Q., Dai, J., Mitra, D., & Zelevinsky, T., Direct laser cooling of calcium monohydride molecules. 2022, *New J. Phys.*, 24, 083006, DOI:10.1088/1367-2630/ac806c