FIRST DETECTION OF THE RADIOACTIVE MOLECULE $^{26}$AlF AND ITS SPECTROSCOPIC ASPECTS

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The observation of radioactive isotopes, like $^{26}$Al, gives insights into the nucleosynthesis processes of stellar cores\(^1\). Until now, characteristic $\gamma$-photons released during radioactive decay of the $^{26}$Al nucleus have been used to record the $^{26}$Al-spatial distribution on a large scale\(^2\), but due to the limited detection sensitivity this method generally fails to identify individual stellar objects on a local scale. An alternative approach to the detection of $^{26}$Al is the spectroscopic observation of molecules containing the radioactive isotope, like $^{26}$AlF. These molecules can be formed in the outer atmosphere of late-type stars. Submillimeter-telescope facilities, like ALMA, can identify these species via their rotational spectra.

In this work, the first astronomical detection of a radioactive molecule, $^{26}$AlF, in a stellar source, $CK$ $Vul$, is reported\(^3\). A global data analysis, including data of the stable $^{27}$AlF molecule taken from the literature, in combination with astronomical data of $^{26}$AlF, reveals the molecular structure beyond the Born-Oppenheimer (BO) limit, resulting in experimentally derived BO correction coefficients of AlF for the first time. Further candidate stellar sources of $^{26}$Al will be discussed.

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