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A new Time-of-Flight noble gas mass spectrometer for the measurement of very low gas amounts

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During the last years we developed and built a new type of noble gas mass spectrometer; the first Time-of-Flight (ToF) noble gas mass spectrometer able to measure all types of noble gases. While ToF spectrometer exist already for the resonance ionization of Kr and Xr, our instrument uses electron impact ionization coupled to an ion trap, which allows us to ionize and measure all noble gas isotopes with a high efficiency. After having set-up the prototype, which already worked as expected from ion-optical modeling, we improved the system in the last years quite significantly. The new generation has an improved detector set-up that allows us to measure in ion counting mode. This in turn eliminates background signals and thereby significantly reduces the detection limit. In addition, we improve the pulse-system, which now allows pulse frequencies up to 10 kHz. Finally, we developed computer code systems to fully control the spectrometer and for data analysis. The new instrument in now fully operational and we start measuring noble gases in presolar nanodiamonds.

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