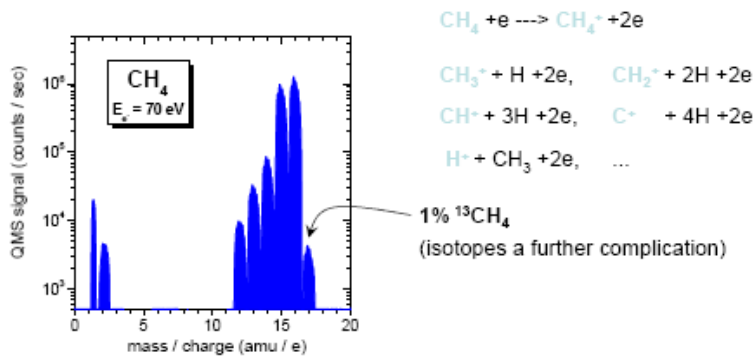
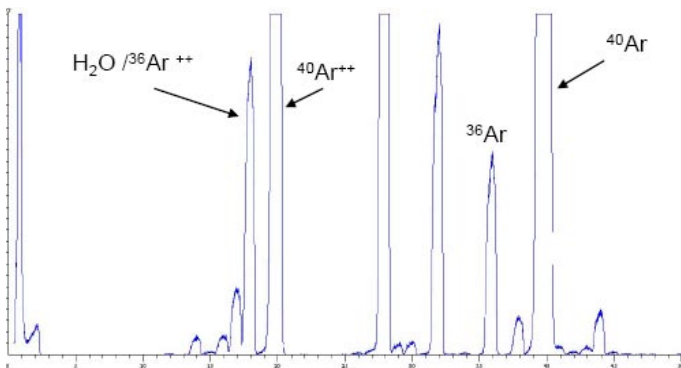




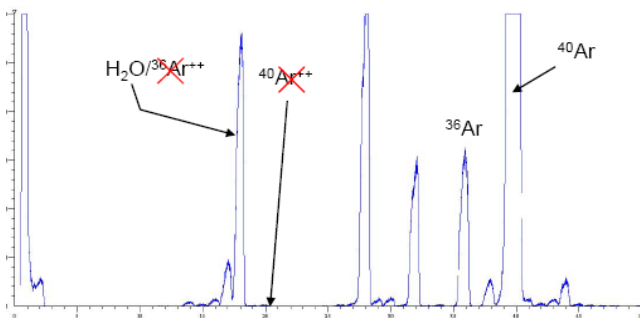
This can result in quite complex spectra even from simple molecules or mixtures, as illustrated in the example below for methane.



The situation may be further complicated by matrix effects, which are interferences from the bulk or carrier gas, such as the doubly ionised Ar<sub>36</sub> isotope overlapping with low level water measurement at m/e=18amu.



Using different, lower electron energies, can greatly simplify complex mixture analysis by reducing fragmentation and introducing a degree of selectivity not otherwise possible. The same spectrum as above is shown below, this time measured with an ionising electron energy of 35eV.



At 35eV the argon peak is not doubly ionised, because the electron energy is below the threshold energy at which this process occurs. The resulting spectrum is now free from interference with water measured at m/e=18 amu.

Soft ionisation is particularly useful when analysing gas mixtures with organic components which can produce many overlapping fragments. It is used successfully in applications ranging from TGA-MS (of polymers/pharmaceuticals etc.) to fuel cell, catalysis and environmental off gas analysis. The table below provides some additional ionisation energies of several common inorganic and organic species.

	N <sub>2</sub>	O <sub>2</sub>	Ar	CO	CO <sub>2</sub>	NH <sub>3</sub>	NO	CH <sub>4</sub>
	Nitrogen	Oxygen	Argon	Carbon monoxide	Carbon dioxide	Ammonia	Nitric oxide	Methane
I.E. / eV	15.58	12.07	15.76	14.01	13.77	10.07	9.26	12.61
	C <sub>2</sub> H <sub>2</sub>	C <sub>2</sub> H <sub>4</sub>	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	C <sub>2</sub> H <sub>6</sub>	C <sub>2</sub> H <sub>5</sub> OH	C <sub>3</sub> H <sub>6</sub> O	C <sub>3</sub> H <sub>8</sub> O	C <sub>3</sub> H <sub>8</sub> O
	Ethyne	Ethene	Acetic acid	Ethane	Ethanol	Propanal	Acetone	IPA
I.E. / eV	11.40	10.51	10.65	11.56	10.43	9.96	9.70	10.17
	C <sub>2</sub> H <sub>6</sub> O	C <sub>6</sub> H <sub>6</sub>	C <sub>6</sub> H <sub>14</sub>	C <sub>6</sub> H <sub>12</sub>	CH <sub>3</sub> OH	CH <sub>2</sub> O <sub>2</sub>	CH <sub>2</sub> O	CCl <sub>4</sub>
	DME	Benzene	Hexane (n)	Cyclohexane	Methanol	Formic acid	Formaldehyde	Carbon Tet.
I.E. / eV	9.72	9.24	10.13	9.86	10.85	11.33	10.88	11.47

### MKS Cirrus Quadrupole Gas Analysers



MKS mass spectrometers are equipped with a soft ionisation mode that provides full software control of the ionising electron energy over the range 0-150eV. Soft ionisation can greatly simplify complex gas analysis and introduce a useful degree of selectivity into the measurement.