Mass-spectrometric evolved gas analysis - an useful tool in materials- and geo-sciences

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The analysis of the degassing behavior of crystalline materials, glasses and glass-forming melts as well as of the industrially used raw materials elucidate the shortcomings of glasses and crystalline materials. Furthermore, they allow for an optimization of the production processes.

Gas release profiles of natural vitreous and crystalline rocks and minerals originating from various geological formations exhibit significant differences according to their genesis [1]. A special device, the *D*irectly *E*volved *G*as *A*nalysis *S*ystem (*DEGAS*), was developed for this purpose [2]. This technique directly couples a thermobalance to a mass spectrometer thus allowing for the analysis of the volatiles released upon heating in vacuum. Molecules such as H_2O, H_2, hydrocarbons, CO, CO_2, N_2, HF, HCl, O_2, or sulphur- and boron-containing species were followed [3-6].

Among the most significant results one can mention the following ones:

- The hydrogen release from minerals and rocks,
- The formation of abiotic hydrocarbons,
- Indication of a different sulfur speciation,
- Indication of volatiles in nominally volatile-free minerals,
- The formation of oxygen during the high-temperature reduction process of polyvalent ions.

The gas release profiles enable us to distinguish between pristine volatiles and secondary alteration products in minerals and rocks [7].

The quantification of released volatiles by using crystalline reference materials with a stoichiometric composition succeeded in the case of H_2O, CO_2, SO_2 and O_2 [8].

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