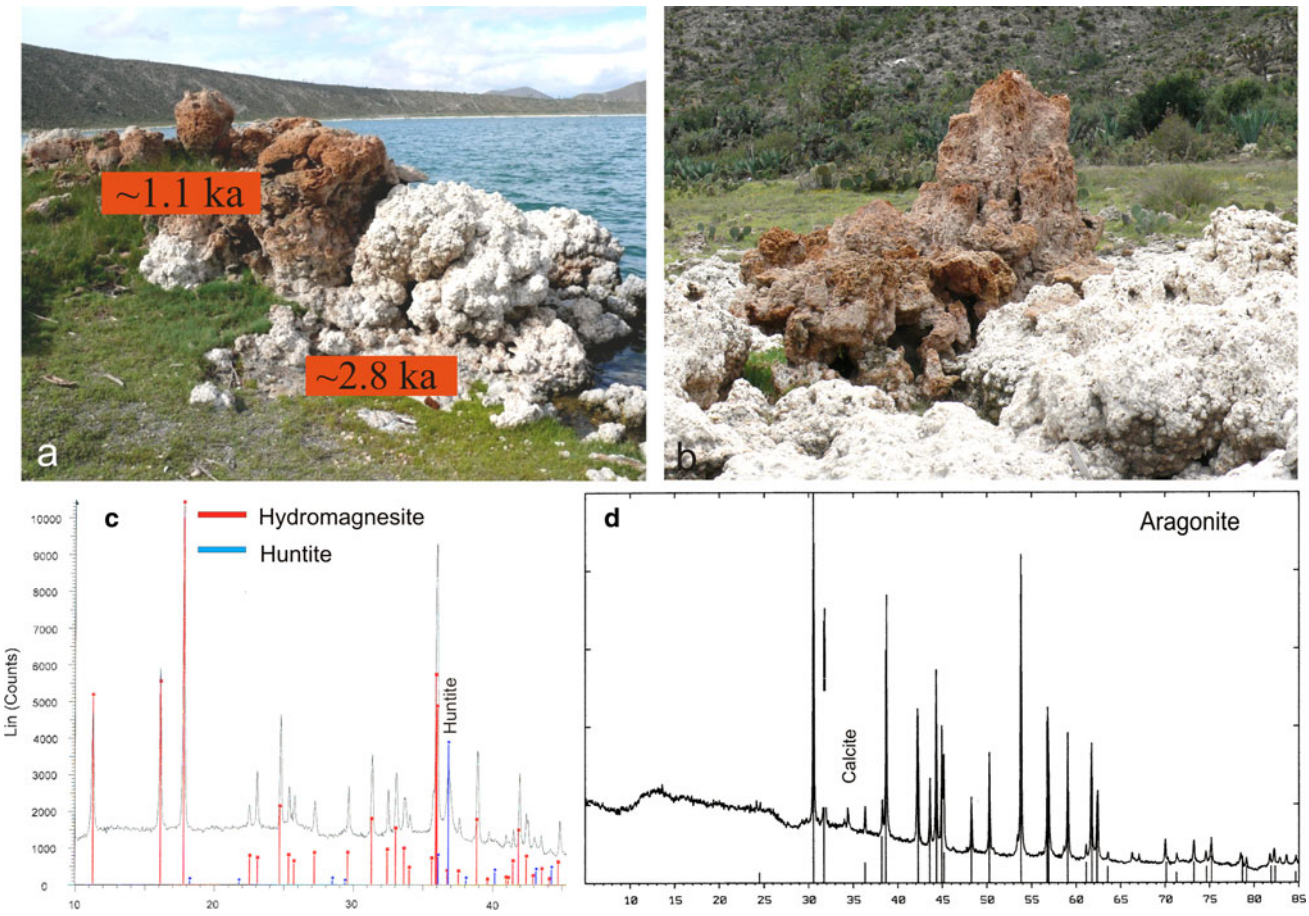

Fig. 8 **a**, **b** Field views of subfossil "brown" and "white" generation of Alchichica microbialites emerged above lake level. U-Th radiometric datings of the two basically different microbial carbonate deposits are indicated in (**a**). **c** X-ray diffractogram showing spectra of hydromagnesite and huntite typical for the "white" generation of microbialites (sample A-19). **d** X-ray diffractogram of aragonite (with small admixture of calcite) dominating the "brown" generation (sample A-16)

(2). **"Brown" microbialites,** which in larger amounts occur on the western shore of the lake and, as isolated groups, in a few other sites. They are in direct contact with the "white" microbialites, and often even overgrowing them (Fig. 8a, b). The "brown" microbialites occur typically as groups of tightly adhering irregular chimney-like structures (Fig. 9a, b) passing laterally into palisade- or candelabra-like columns. Macroscopically, these microbialites have non-laminated, porous, and spongy texture and often a more or less visible central canal in each column (Fig. 9b). A less common variety of the "brown" microbialites are horizontally laminated, cm to dm-thick crusts, which qualify as stromatolitic structures. The "brown" microbialites occupy, as a rule, sites higher and closer to the crater wall than the "white" microbialites. On the flat onshore terrace they grade into dm-thick encrustations composed of microbially cemented bunches of the vascular water plants *Rupia* and *Cyperus* (Fig. 9c–f).

Mineralogy and EDS analyses of Alchichica microbialites

EDS and XRD analyses show distinct differences in the mineral and elemental composition of the "white" and "brown" microbialites. These differences are of importance in understanding microbialite morphogenesis. Differences in mineral phases forming at the contact with the living cyanobacterial mat, as well as diagenetic processes occurring in deeper parts of microbialites, are particularly interesting.

The underwater microbialite samples (4, 8, and 14 m) were investigated by EDS mapping and EDS spot analysis for Ca, Mg, and Si at their contact with the living cyanobacterial mat. In all cases, a <1-mm-thick layer rich in Ca was found. This layer passes downward, either continuously