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## Volatile organic compounds in barite-hosted fluid inclusions from the 3.5 Ga old Dresser Formation, Western Australia

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The c. 3.5 Ga Dresser Formation of the East Pilbara Craton (Western Australia) contains large amounts of blackish barite. These rocks produce an intense sulfidic odor when crushed, resulting from abundant primary fluid inclusions. In part, the black barites are interbedded with sulfidic stromatolites. Using Raman spectroscopy, microthermometry, and two different online GC–MS approaches, we characterized in detail the chemical composition of the barite-hosted fluid inclusions. Our GC–MS techniques were based on (i) thermodecrepitation at 150–250°C and (ii) solid phase microextraction (SPME)–GC–MS at reduced temperature (50°C), thereby minimizing external contamination and artefact formation. Major fluid inclusion classes yielded mainly H<sub>2</sub>O, CO<sub>2</sub>, and H<sub>2</sub>S in varying abundance, along with minor amounts of COS and CS<sub>2</sub>, N<sub>2</sub>, and CH<sub>4</sub> (< 1%). Notably, we also detected a wide range of volatile organic compounds, including short-chain ketones and aldehydes, thiophenes, and various organic (poly)sulfides. Some of these compounds (CH<sub>3</sub>SH, acetic acid) have previously been invoked as initials agents for carbon fixation under primordial conditions, but up to now their presence had not been observed in Precambrian materials. Based on our findings, we hypothesize that hydrothermal seepage of organic and inorganic compounds during Dresser times provided both, catabolic and anabolic substrates for early microbial metabolisms.