Geobiology of an exceptionally preserved Archean microbial mat facies (Strelley Pool Formation, Western Australia)

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Paleoarchean rocks from the Pilbara Craton (Western Australia) provide a variety of evidence for early life on Earth [1]. However, some of these evidences could also be explained by non-biological processes [1]. Stromatolites in the 3.35 Ga Strelley Pool Formation are e.g. widely interpreted as biogenic structures [e.g. 2-4], but some authors argue for an abiogenic origin [e.g. 5]. Further lines of evidences are therefore required to make a good case for the biogenicity of these stromatolites. Here we describe a microbial mat facies characterized by a primary "zebra fabric" which is closely associated with stromatolites in the Strelley Pool Formation [6]. By combining detailed field and thin section observations with various (bio-) geochemical analyses (e.g. SEM-EDX, Raman spectroscopy, ToF-SIMS, NanoSIMS) we draw conclusions on the biogenicity, paleoenvironment, and taphonomical processes of the microbial mat facies. The results do not only confirm the presence of microbial mat systems in the Strelley Pool Formation, but also help to identify potential biosignatures in other Paleoarchean rocks.

[1] Van Kranendonk (2006) *Earth-Sci. Rev.* **74**, 197-240 [2] Lowe (1980) *Nature* **284**, 441-443 [3] Van Kranendonk et al. (2003) *Geobiol.* **1**, 91-108 [4] Allwood et al. (2006) *Nature* **441**, 714-718 [5] Lindsay et al. (2005) *Prec. Res.* **143**, 1-22 [6] Reitner et al. (eds. 2014) GAIA inform