Optimal activity of soluble methane monooxygenase through the regulation of O_2 and C-H activation

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CH_4 is considered as one of the most important greenhouse gases owing to its 20-fold higher heat capacity compared with that of CO_2. Preliminary studies have aimed to elucidate the mechanisms of sMMO involved in this extremely stable C–H activation through intermediate studies, advanced spectroscopies, and structural researches, mostly in *M. trichosporium* OB3b and *M. caps* (Bath), although mechanistic studies are still required.

M. sporium 5 was cultured in a regulated NMS media by supplying CH_4 and air to understand its growth and the expression levels of multi-component enzymes. MMOH, MMOB and MMOR were found to be highly expressed in *M. sporium* 5, and it was purified to evaluate its catalytic activities using diverse substrates. The sMMO enzymes were utilized to measure SEA, and these results showed that *M. sporium* 5 exhibits optimal activity at pH 7.5. The electron transfer environment of MMOR is crucial for the activity of sMMO, and different acidities may change the electron transfer environment. *In vitro* activity measurements demonstrated that alkanes, halogens, benzene, and toluene are oxidized through sMMO, and 2 mol equivalents of MMOB showed optimal activity.