Daytime and nighttime aragonite are revealed by oxygen isotope analyses from coral Acropora cultured in controlled conditions, likely deposited out of thermodynamic equilibrium.

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Six colonies have been cultured, using a factorial design of three temperatures (22, 25 and 28 °C) and two light intensities (200 and 400 μmol photon m^{-2} s^{-1}). An average of 46 stable oxygen ratio measurements has been randomly distributed on newly formed aragonite from each colony, essentially composed of fibers. Histograms of oxygen isotopic composition show significant bimodality due to two distinct fractionations. The unique discrepancy experienced by colonies is the diurnal cycle inducing fractionations governed by different processes. The lowest data corresponding to nighttime deposit are only temperature sensitive, while the highest ones corresponding to daytime precipitation are light depending. Commonly, it is admitted that pH at the calcification site, documented by biologic investigations is responsible of different precipitation processes. Knowing that pH measured during daytime is higher than during nighttime, isotopic composition of daytime should be lower than nighttime aragonite, following McCrea (1970) early work. However, we observed opposite oxygen isotopic distribution. We conclude that aragonite precipitation does not obey to thermodynamic rules.