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Scientific Achievement:
Developed a natural-gas-fired combustor with near-zero NO\textsubscript{x} emissions and low temperatures as a hybrid heating source for the solar thermal Brayton cycle using supercritical CO\textsubscript{2} as working fluid.

Significance and Impact:
A single-stage combustor using lean catalytic combustion of methane was developed for a thermal power output of about 35 kW. Stable, ultra-lean operation of the combustor was successfully demonstrated at methane-air equivalence ratios as low as 0.2.

Research Details:
The highlights of the work are summarized below:
• Both ceramic and metallic monoliths with platinum catalyst were used to fabricate the single-stage catalytic combustor.
• Combustor exhaust temperatures are in the range of 1,060–1,170 K for methane-air equivalence ratios (\(\phi\)) in the range of 0.2–0.4. These low temperatures are desirable from the viewpoint of material limitations of the heat exchanger.
• Measured NO\textsubscript{x} emissions are in the range of 1–2 ppm for the range of conditions studied.


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