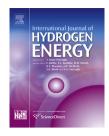


Available online at www.sciencedirect.com

### **ScienceDirect**

journal homepage: www.elsevier.com/locate/he



## Syngas production from methane dry reforming over SmCoO<sub>3</sub> perovskite catalyst: Kinetics and mechanistic studies



# Osarieme Uyi Osazuwa <sup>a,b</sup>, Herma Dina Setiabudi <sup>a</sup>, Sureena Abdullah <sup>a</sup>, Chin Kui Cheng <sup>a,b,\*</sup>

<sup>a</sup> Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang Kuantan, Pahang, Malaysia

<sup>b</sup> Centre of Excellence for Advanced Research in Fluid Flow (CARIFF), Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang Kuantan, Pahang, Malaysia

#### ARTICLE INFO

Article history: Received 2 December 2016 Received in revised form 25 February 2017 Accepted 9 March 2017 Available online 4 April 2017

Keywords: Dry reforming Kinetics Methane Perovskite SmCoO<sub>3</sub> Syngas

### ABSTRACT

The kinetics of the methane dry (CO<sub>2</sub>) reforming over the SmCoO<sub>3</sub> was investigated in the temperature ranged 973–1073 K by varying the CH<sub>4</sub> and CO<sub>2</sub> partial pressures. Based on detailed study of the reaction mechanism, a mechanistic model is proposed from which a kinetic model is derived. The mechanistic pattern assumes adsorption of CH<sub>4</sub> on reduced Co, followed by methane cracking and carbon deposition. CO<sub>2</sub> reacts with Sm<sub>2</sub>O<sub>3</sub> to form Sm<sub>2</sub>O<sub>2</sub>CO<sub>3</sub> and the oxycarbonates react with carbon to produce CO. The power law and Langmuir–Hinshelwood kinetic model which is established on this mechanism were able to forecast the kinetic results.

© 2017 Hydrogen Energy Publications LLC. Published by Elsevier Ltd. All rights reserved.

E-mail address: chinkui@ump.edu.my (C.K. Cheng).

http://dx.doi.org/10.1016/j.ijhydene.2017.03.061

0360-3199/© 2017 Hydrogen Energy Publications LLC. Published by Elsevier Ltd. All rights reserved.

<sup>\*</sup> Corresponding author. Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang Kuantan, Pahang, Malaysia. Fax: +60 9 5492889.