

**Crossover SAFT-LJ EOS for  
modeling vapor-liquid  
equilibria and PVT<sub>x</sub> properties  
of the CO<sub>2</sub>-H<sub>2</sub>O system at the  
critical region**

RUI SUN<sup>1</sup>

<sup>1</sup> State Key Laboratory of Continental Dynamics,  
Department of Geology, Northwest University,  
Xi'an 710069, China, E-mail address:  
ruisun@nwu.edu.cn

A new crossover equation of state (EOS) for the CO<sub>2</sub>-H<sub>2</sub>O system was developed by incorporating White's renormalization-group (RG) theory into the SAFT-LJ EOS improved by us previously. The crossover EOS uses the RG method to account for contributions to the free energy of long-range density fluctuations which dominates at the critical region in terms of a recursion procedure and reduces to the SAFT-LJ EOS far from the critical region. Two component-dependent parameters were introduced into the RG method to capture thermodynamic behaviors of fluids. Comparisons with experimental data shows that this crossover EOS can represent vapor-liquid equilibria and PVT<sub>x</sub> properties of the H<sub>2</sub>O, CO<sub>2</sub> and CO<sub>2</sub>-H<sub>2</sub>O systems at both near and far from critical regions with high accuracy.