

---

**Supporting Information for**

**Cracking Behavior of Heavy Petroleum Polar Species in  
Collision Induced Dissociation and Thermal Visbreaking**

Haiyang Yu<sup>1</sup>, Xieling Fang<sup>2</sup>, Ying Zhang<sup>2</sup>, Linzhou Zhang<sup>2\*</sup>

*1. PetroChina (Xinjiang) Petroleum Engineering Co., Ltd, Design Branch, Xinjiang,  
Karamay, 834000*

*2. State Key Laboratory of Heavy Oil Processing & Petroleum Molecular Engineering  
Center (PMEC), China University of Petroleum, Beijing 102249, People's Republic of  
China*

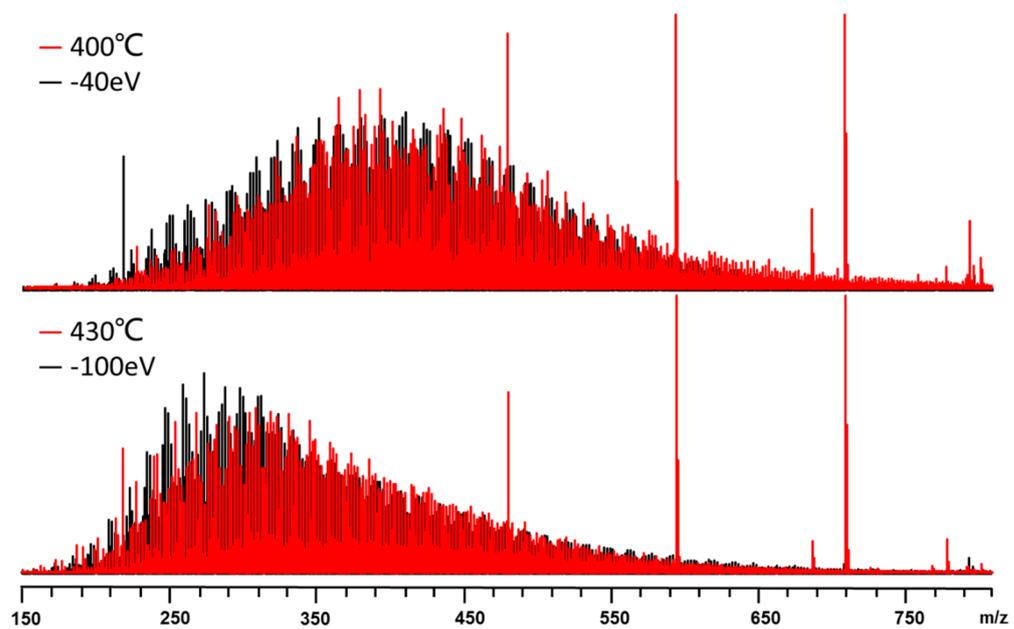


Fig. S1 Overlapped +ESI FT-ICR mass spectra of Venezuela VR thermal reaction products and CID products

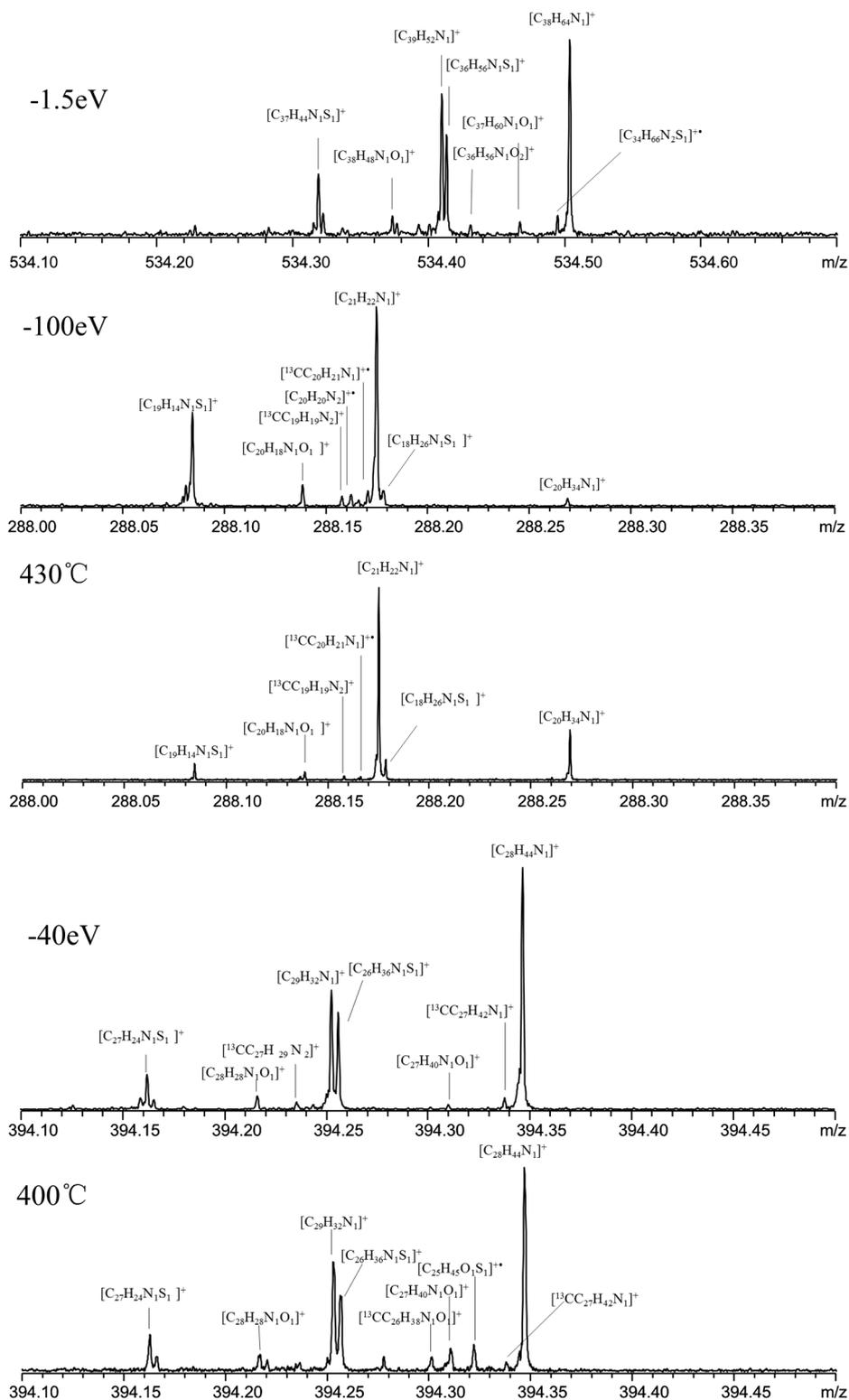


Fig. S2 Expanded +ESI FT-ICR mass spectra of Venezuela VR thermal reaction products and CID products

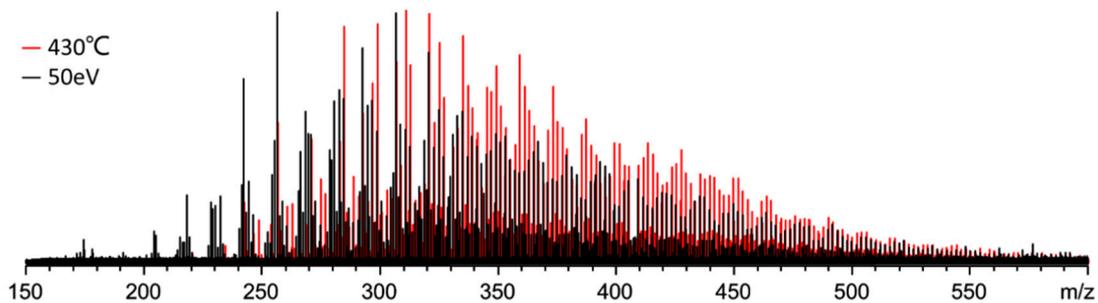


Fig. S3 Overlapped -ESI FT-ICR mass spectra of Venezuela VR thermal reaction products and CID products

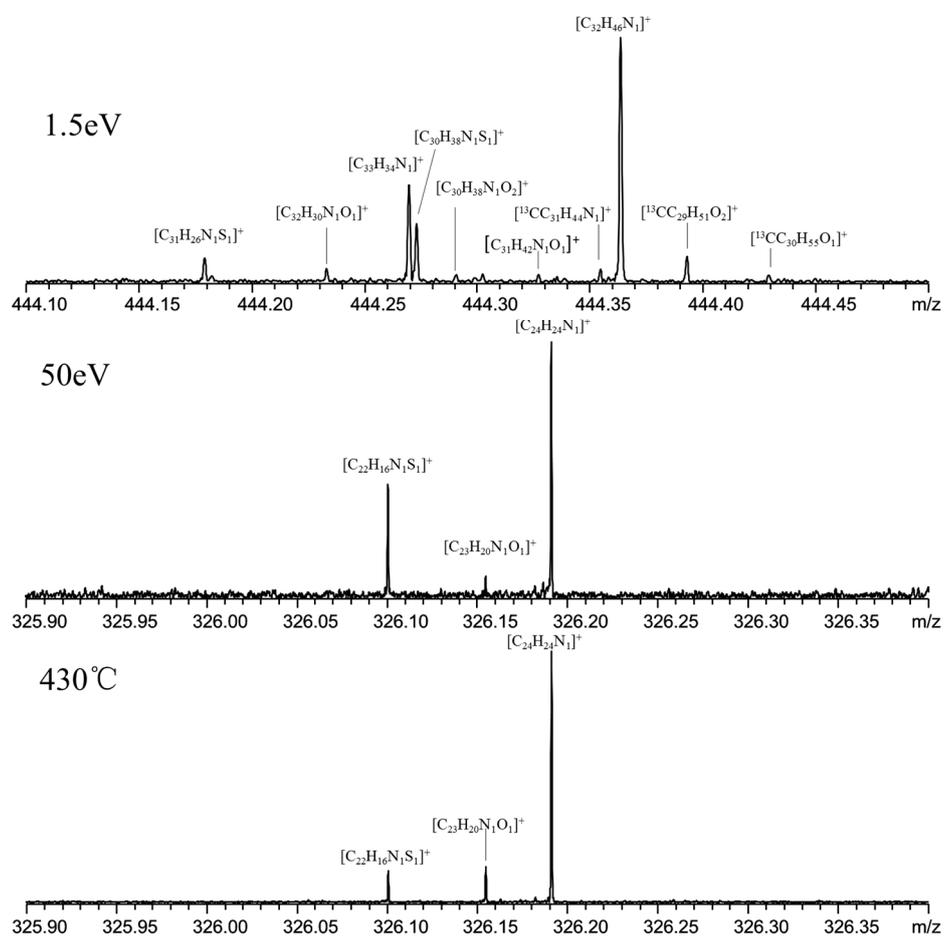


Fig. S4 Expanded -ESI FT-ICR mass spectra of Venezuela VR thermal reaction products and CID products

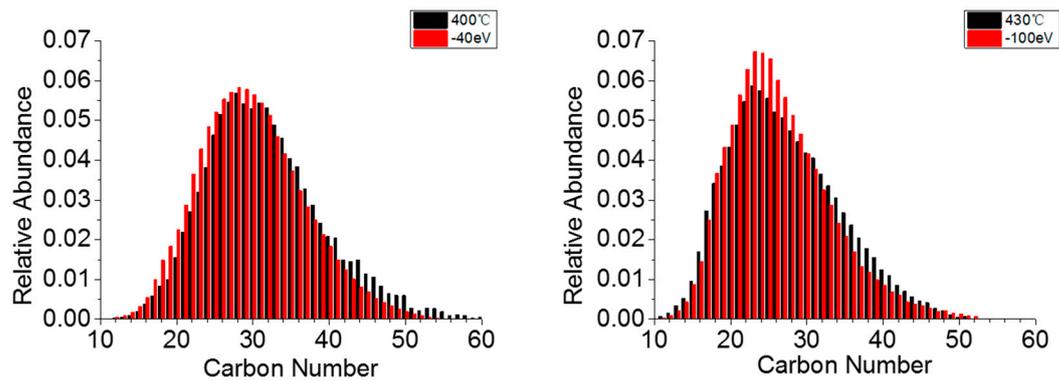


Fig. S5 Overlapped carbon number distribution in +ESI FT-ICR mass spectra of Venezuela VR thermal reaction products and CID products