

Chemometric differentiation of natural gas types in the Turpan-Hami Basin, NW China

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Chemometrics is an useful tool for evaluation of multivariate data [1]. Two of most common chemometric methods are hierarchical cluster analysis (HCA) and principal component analysis (PCA), which are frequently applied to reveal oil genetic type [2] and yield a detailed oil-source rock correlation [3]. These two methods were therefore first introduced to identify the natural gas type in complex area (e.g. Turpan-Hami Basin). The chemometric analysis was completed using Pirouette[®] software (Infometrix, Inc.). The HCA was performed using autoscale preprocessing, Euclidean metric distance, and complete linkage, and PCA is similar as HCA. The chemometric analysis include 6 geochemical parameters, as follows %C₁-%C₃ and $\delta^{13}\text{C}_1$ - $\delta^{13}\text{C}_3$.

Four genetic types of natural gas in the Turpan-Hami Basin have been identified by HCA (Fig. a) and PCA (Fig. b), namely Type A (oil-associated gas), Type B (coal-derived gas), Type C (mixing gas) and Type D (biodegraded gas). These results are in good agreement with geochemical characteristic of gas and geological evidence.

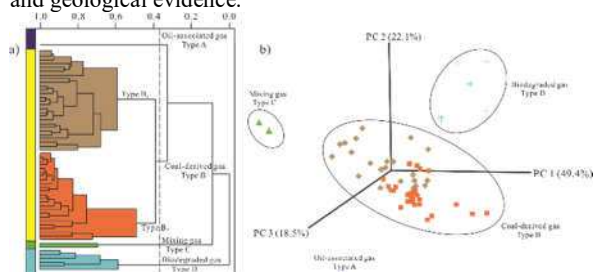


Figure 1: HCA (a) and PCA (b) show the natural gas types in the Turpan-Hami Basin (data from previous studies[4, 5, 6, 7, 8])

[1] Peters *et al.* (2005) *Cambridge*, Volume 2. [2] Peters *et al.* (2016) *Am. Assoc. Petrol. Geol. Bull.* 100, 115-135. [3] Wang *et al.* (2017) *Mar. Petrol. Geol.* 89, 665-686. [4] Dai *et al.* (2009) *Int. J. Coal. Geol.* 80, 124-134. [5] Dai *et al.* (2014) *Org. Geochem.* 74, 123-142. [6] Gong *et al.* (2017) *JNGSE* 46, 338-349. [7] Li *et al.* (2001) *Org. Geochem.* 32, 1127-1151. [8] Ni *et al.* (2015) *Int. J. Coal. Geol.* 152, 144-155.