ISOLATION OF DIAMONDOIDS PRESENT IN CONDENSATES: TO PERFORM COMPOUND-SPECIFIC ISOTOPE ANALYSIS

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The petroleum systems can be very complex and include several hydrocarbon sources with accumulations of high and low molecular weight oils. In such systems, important sources of hydrocarbons may be undetected when classic analyses of biomarkers and total oil (bulk) isotopes are performed. Because of the thermic evolution and high maturity of crude oil, many biomarkers are destroyed, and in the correlation of condensates and oils there would be a problem because of a depleted concentration in these molecules. Consequently, there is a need to develop new geochemical methods based in the analyses of diamondoids molecules present in petroleum, which being thermically more stable, subsist when most biomarkers are lost (Dahl et al., 1999; Moldowan et al., 2009). In this way, analyses of diamondoids and its compound-specific isotope analysis (CSIA-D) help to solve interpretation problems and its oil to oil correlation. To this aim, isolation and concentration of diamondoid molecules is needed for its posterior analysis of CSIA-D, since the diamondoids co-elute highly with other molecules *i.e.* iso– and cyclo-alcanes, and besides, they have very low concentration compared with other present hydrocarbons. Consequently, in this report a methodology is proposed to isolate diamondoids using a distillation system with a selective separation column in gas phase of the saturated fraction of a condensate, using as adsorbing material a carbon molecular sieve. This mesh was developed in the Instituto Mexicano del Petróleo, and has been reported previously (Jimenez-Cruz et al., 2007).

An homologue series of adamantanes was obtained, which were: adamantane, 1-methyl-adamantane, 1,3-dimethyl-adamantane, 1,3,5-trimethyl-adamantane, 2-methyl-adamantane, 1,4-dimethyl-adamantane *cis*, 1,4-dimethyl-adamantane *trans*, 1,3,6-trimethyl-adamantane, 1,2-dimethyladamantane, and in a lower concentration: 1,3,4-trimethyl-adamantane *cis* and 1,3,4-trimethyl adamantane *trans*, 1-ethyl adamantane, 1-ethyl-3-methyl adamantane, 1-ethyl-3,5-dimethyl adamantane and 2-ethyl adamantane.

In this research, an effective new method was implemented to isolate and concentrate molecules of adamantane and its methylated derivatives present in the condensates, to perform the compound-specific isotope analysis (CSIA-D). The $\delta^{13}C$ values obtained for the adamantanes by using GC-C-IRMS are in the range of -25 to -28‰.

References:

Dahl, J.E., Moldowan, J.M., Peters, K.E., Claypool, G.E., Rooney, M.A., Michael, G.E., Mello, M.R., Kohnen, M.L., 1999. Diamondoid hydrocarbons as indicators of natural oil cracking. Nature, 399, 54-57.

Jiménez-Cruz, F., Hernández, J.A., Laredo, G.C., Mares-Gallardo, M.T., García-Gutierrez, J.L., 2007. Adsorption of n-Heptane and 2-methylheptane in the gas phase on polyvinylidene chloride-based microporous activated carbon. Energy & Fuels, 21, 2929-2934.

Moldowan, J.M., Dahl, J., Zinniker, D., Denisevich, P., Moldowan S.M., Fago, F.J., Bott, G. 2009. Recent developments in Geochemistry take exploration strategy to the next level. 24th International Meeting on Organic Geochemistry. September 6-11, 2009, Bremen, Germany.