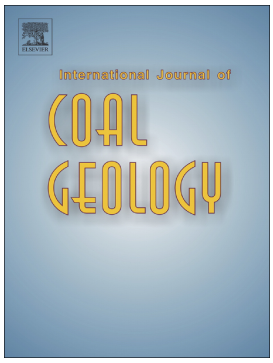

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A.G. Borrego, A. López García, O. Merino-Tomé

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Petrographic and geochemical characterization of organic-rich Mississippian black shales in the north of Spain: Vegamián Formation, Cantabrian Zone

A.G. Borrego[a,*], A. López García[a,b], O. Merino-Tomé[b],

Corresponding author: A.G. Borrego (angeles@incar.csic.es)

[a.] Instituto Nacional del Carbón (INCAR-CSIC). C/Francisco Pintado Fe 26, 33011, Oviedo, Spain.

[b]. Department of Geology. University of Oviedo. C/Arias de Velasco s/n, 33005 Oviedo, Spain.

Abstract

Black shales (1-60 m thick) with minor cherts (radiolarites) and phosphate nodules of Mississippian age (Middle – Upper Tournaisian; Vegamián Formation) occur in the fold-and-thrust belt of the Cantabrian Zone (N Spain) at the base of the Carboniferous succession, which is infilling the Variscan foreland basin. The Vegamián Formation was accumulated in a similar sedimentary and paleogeographic context to the Upper Devonian-Carboniferous black shales of the Appalachian, Arkoma, Fort Worth, Western Canada and Antler foreland basins (North America) and to the Variscan foreland basin in Belgium and Germany. Five stratigraphic sections were investigated in the southern branch of the Cantabrian Zone, corresponding to the shallower sectors of the passive margin of the Variscan foreland basin in N Spain, where this stratigraphic unit reaches a thickness of generally less than 15 m. The total organic carbon (TOC) ranges from 2.81 wt.% to 7.43 wt.% with a significant number of values over 5 wt.% indicating a high level of organic matter preservation. Thermal maturity can be considered to be between the peaks of oil and wet gas generation. The total sulphur (TS) content is generally low with few samples showing values higher than 1.5 wt.%.