

# SANDSTONE PETROGRAPHY OF CONTINENTAL DEPOSITIONAL SEQUENCES OF AN INTRAPLATE RIFT BASIN: WESTERN CAMEROS BASIN (NORTH SPAIN)

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**ABSTRACT:** The Cameros Basin in Central Spain is an intraplate rift basin that developed from Late Jurassic to Middle Albian time along NW--SE trending troughs. The sedimentary basin fill was deposited predominantly in continental environments and comprises several depositional sequences. These sequences consist of fluvial sandstones that commonly pass upward into lacustrine deposits at the top, producing considerable repetition of facies. This study focused on the western sector of the basin, where a total of seven depositional sequences (DS-1 to DS-7) have been identified.

The composition of sandstones permits the characterization of each sequence in terms of both clastic constituents and provenance. In addition, four main petrofacies are identified. Petrofacies A is quartzo-sedimentolithic (mean of  $Qm_{85}F_2Lt_{13}$ ) and records erosion of marine Jurassic pre-rift cover during deposition of fluvial deposits of DS-1 (Brezales Formation). Petrofacies B is quartzofeldspathic (mean of  $Qm_{81}F_{14}Lt_5$ ) with  $P/F > 1$  at the base. This petrofacies was derived from the erosion of low- to medium-grade metamorphic terranes of the West Asturian Leonese Zone of the Hesperian Massif during deposition of DS-2 (Jaramillo Formation) and DS-3 (Salcedal Formation). Quartzose sandstones characterize the top of DS-3 (mean of  $Qm_{92}F_4Lt_4$ ). Petrofacies C is quartzarenitic (mean of  $Qm_{95}F_3Lt_2$ ) with  $P/F > 1$  and was produced by recycling of sedimentary cover (Triassic arkoses and carbonate rocks) in the SW part of the basin (DS-4, Peñacoba Formation). Finally, depositional sequences 5, 6, and 7 (Pinilla de los Moros--Hortigüela, Pantano, and Abejar--Castrillo de la Reina formations, respectively) contain petrofacies D. This petrofacies is quartzofeldspathic with  $P/F$  near zero and a very low concentration of metamorphic rock fragments (from  $Qm_{85}F_{11}Lt_4$  in Pantano Formation to  $Qm_{73}F_{26}Lt_1$  in Castrillo de la Reina Formation). Petrofacies D was generated by erosion of coarse crystalline plutonics located in the Central Iberian Zone of the Hesperian Massif. In addition to sandstone petrography, these provenance interpretations are supported by clay mineralogy of interbedded shales. Thus, shales related to petrofacies A and C have a variegated composition (illite, kaolinite, and randomly interlayered illite--smectite mixed-layer clays); the presence of chlorite characterizes interbedded shales from petrofacies B; and Illite and kaolinite are the dominant clays associated with petrofacies D.

These petrofacies are consistent with the depositional sequences and their hierarchy. An early megacycle, consisting of petrofacies A and B (DS-1 to DS-3) was deposited during the initial stage of rifting, when troughs developed in the West Asturian Leonese Zone. A second stage of rifting resulted in propagation of trough-bounding faults to the SW, involving the Central Iberian Zone as a source terrane and producing a second megacycle consisting of petrofacies C and D (DS-4, DS-5, DS-6, and DS-7). Sandstone composition has proven to be a powerful tool in basin analysis and related tectonic inferences on intraplate rift basins because of the close correlation that exists between depositional sequences and petrofacies.