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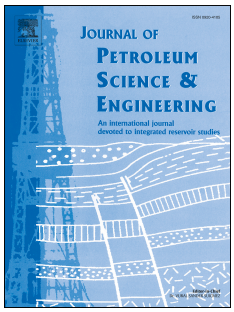

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Permeability prediction from mercury injection capillary pressure curves by partial least squares regression method in tight sandstone reservoirs

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Abstract

Permeability is an essential petrophysical parameter for reservoir modeling, reservoir classification, and productivity prediction in tight sandstone reservoirs. In this study, multiple parameters are extracted from the mercury injection capillary pressure (MICP) curves and the degree of multicollinearity between these parameters is analyzed. The partial least squares regression (PLSR) method is used for establishing the permeability prediction model and the optimal number of latent variables of the model is determined by the leave-one-out cross-validation (LOOCV) method. A comparison of the existing empirical models, the permeability prediction model by ordinary least square (OLS) method, and the permeability prediction model by PLSR method based on the MICP curves indicates that the permeability prediction model by PLSR method is superior to the other models for tight sandstone reservoirs.

Keywords: Permeability; Mercury injection capillary pressure curve; Partial least squares regression; Tight sandstone reservoirs.

Nomenclature

d_i	incremental mercury injection at the *i*th capillary pressure
d_T	the total incremental mercury injection
F	formation factor
G	pore geometrical factor in Thomeer model
k	permeability
np	number of pore throat radii
P_c	capillary pressure