**Introduction**

Rock classification is a common practical approach to enhance reservoir description, evaluation, modeling, and simulation. The scope of rock classification is typically limited to reservoir rocks for the specific purpose of reservoir characterization. The definition of rock type highly depends on the people who perform the task with their own specific objectives. Geologists consider rock types as deposition facies or lithofacies; Petrophysicists describe rock types as petrographic facies or grain/pore types. Reservoir or production engineers regard rock types as flow units. In a reservoir with negligible diagenesis, it is more likely for those rock types of different definitions to match each other (Ali-Nandalal et al., 2003; Acosta et al., 2005). However, mostly we are dealing with highly heterogeneous reservoirs where geological facies, petrophysical rock types, and flow units significantly differ (Rushing et al., 2008). In either case, rock classification has been proved to be a valid and effective strategy in assisting people to deal with complex geological and petrophysical variability. Rock type can be wholly defined as a group of rock bodies that has acceptable petrophysical regression within each group and can be spatially traceable in line with the geological framework (Neo et al., 1998).

In geology, there are numerous schemes for sedimentary rock classification in the literature. Two well-known classic examples are the Wentworth scale of particle sizes in clastic sedimentary rocks (Wentworth, 1922) and the Dunham’s scheme of mud-grain composition in carbonate sedimentary rocks (Dunham, 1962). The classification of clastic sedimentary rocks is further complicated by the clay type and distribution (Neasham, 1977). Lucia modified Dunham’s carbonate classification and introduced rock fabric number to quantify rock pore-scale properties (Lucia, 1995).

In petrophysics, rock classification based on routine and special core measurements was extensively studied by many workers. Pittman published the method of Winland’s *r35* derived from Spindle field sandstone core samples (Pittman, 1992). Amaefule et al. (1993) initialized the concept of hydraulic flow unit (HFU) based on Hagen–Poiseuille flow equation and used the flow zone index (FZI) to characterize several heterogeneous reservoirs. Other methods based on mercury injection capillary pressure data (MICP), pore throat size distribution, and thin sections are also frequently used (Al-Aruri et al., 1998; Clerke et al., 2008; Neo et al., 1998). For rock classification on a larger scale, Gunter et al. (1997) utilized Stratigraphic Modified Lorenz (SML) plot for characterizing reservoir flow units.

However, the rock types established on core measurements need to be propagated to the uncored zones or wells in the reservoir through integration with well log data. Or in some cases where core data is not available, the rock classification needs to be only based on well log responses. Geologists and petrophysicists have been attempting on this topic for decades.

Geologists use well log data to define lithology columns, model depositional facies and study high-resolution stratigraphy (Serra et al., 1975; van Wagoner et al., 1990; Serra, O. & L., 2003). For example, the shape of GR log and SP log are typically used to correlate with grain size changing to define fining-upward or coarsening-upward sequences (Pirson, 1983). Serra initialized the electro-facies concept to study geological sequences based on well logs. However, authors rarely extended their scope beyond GR and SP logs to detect more single-curve and multi-curve log attributes associated with various depositional features. Furthermore, no systematic quantification of these log attributes has been established for large-scale reservoir characterization use.

Petrophysicists use well log data to infer petrophysical information such as clay volume, porosity, and water saturation which provide a good basis for petrophysical rock classification. Generally, a rock type that has less clay content, larger porosity, and smaller irreducible water saturation tends to be of better reservoir quality in terms of storage/flow capacity. Based on this principle, some rock quality indices were calculated from well logs, such as bulk water volume (Buckles, 1965). Some authors use neural network technique to establish a statistical relation between core measurements and various log response to propagate rock types from core domain to log domain (Kharrat et al., 2009).

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