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UNIVERSITI TEKNOLOGI PETRONAS

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by

RULLIYANSYAH

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RULLIYANSYAH

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To my wife & my daughter, with whom I share each of my wonderful day and night
To my mom & dad, two great personality from whom I have achieved a lot
To SEACARL, (hopefully) a 'legendary' laboratory in the making…

'Perhaps, we are well justified in borrowing a parallel expression
from Read's classic paper on granites
as we consider (there is) "dolomites and dolomites".

(Donald Zenger & John B. Dunham, 1980)

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ABSTRACT

The occurrence of dolomite has been reported in several Miocene carbonate platforms of the Central Luconia Province, Sarawak. However their character, origin, and impact on reservoirs properties have received little attention. This study aims at conducting a thorough and comprehensive investigation of the dolomite texture(s) present in two Miocene carbonate platforms of Central Luconia, their most probable origin, impact on reservoir properties, and an assessment of how the lateral distribution will likely be.

A total of sixty five (65) core plugs, thirty (30) from the North Platform and thirty five (35) from the South Platform, were obtained and analyzed with microscopic and geochemical techniques.

Results of the analyses show that the dolomites of the two carbonate platforms have distinctly different textures and considerably different diagenetic features and history. A mimetic replacement dolomitization is predominantly observed in the North Platform succession, where the dolomite retains the original precursor limestone texture. In the South Platform, dolomite is present in mostly non-mimetic replacement style, obliterating the original texture of precursor limestones. Dolomite crystals in both platforms are commonly planar euhedral, with a minor proportion of planar subhedral developed only in the deeper section of the South Platform. The size of the crystals ranges from < 10 µm to 180 µm.

Stable isotope values and trace elements content show that pervasive dolomitization was most likely caused by diluted seawater that circulated on, or near the mixing zone area. Pore-filling and pore-lining dolomite cement may have precipitated from mixed-water in the mixing zone.

An assessment of the geometry of the dolomite bodies, based on the proposed dolomitization model suggests that dolomites could have formed elongated dolomite bodies throughout the platforms, forming massive bodies that mimic the lens shape of a mixing zone. However, their thickness and the depth at which they will be encountered will most likely vary.

ABSTRAK

Kewujudan dolomit adalah sangat diketahui di sebahagian platform di Daerah Tengah Luconia, Sarawak. Namun begitu, sifat, asal dan bagaimana dolomit memberi kesan kepada sifat batuan takungan kurang dikaji, menyebabkan hanya sedikit pengetahuan diketahui tentang dolomit di kawasan ini. Kajian ini bertujuan untuk menjalankan kajian menyeluruh dan komprehensif ke atas tekstur dolomit yang terdapat di Luconia Tengah, kemungkinan terdekat asal dolomit tersebut, kesan ke atas sifat batuan takungan dan penilaian ke atas bagaimana corak sebaran mendatar dolomit di kawasan tersebut.

65 sampel keratan batuan dianalisis dengan menggunakan mikroskop dan teknik geokimia. 30 sampel adalah daripada platform utara, dan selebihnya adalah daripada platform selatan.

Hasil daripada analisis membuktikan bahawa kedua-dua platform karbonat ini menunjukkan tekstur dolomit dan fitur diagenesis serta sejarah yang berbeza. Proses pendolomitan dengan penukaran secara *mimetic* wujud secara dominan di jujukan platform utara mengekalkan ciri-ciri asal tekstur batu kapur. Pada platform selatan, dolomit hadir biasanya secara penukaran tidak *mimetic* menyebabkan tekstur asal batu kapur kini musnah. Kristal dolomit yang terdapat di kedua-dua platform biasanya adlah planar euhedral, dengan hanya sedikie bahagian yang mengandungi kristal subhedral yang terbentuk pada bahagian yang dalam di platform selatan. Saiz kristal berjulat daripada < 10 µm sehingga 180 µm.

Nilai isotop stabil dan kandungan unsur surih menunjukkan bahawa proses pendolomitan yang merebak adalah disebabkan oleh air laut cair yang mengelilingi di atas, atau berhampiran dengan zon percampuran. Simen dolomit yang mengelilingi pori atau memenuhi pori mungkin berpunca hasil daripada percampuran jenis air di zon percampuran.

Geometri bentuk jasad dolomit adalah ditafsirkan berbentuk memanjang sepanjang platform, dengan kemungkinan berlainan kedalaman dan ketebalan di mana ianya bertembung sepanjang platform.

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