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DOLOMITIZATION IN MIOCENE CARBONATE PLATFORMS OF
CENTRAL LUCONIA, SARAWAK: CHARACTER, ORIGIN, AND IMPACT
ON RESERVOIR PROPERTIES

I RULLIYANSYAH

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A Thesis

Submitted to the Postgraduate Studies Programme

as a Requirement for the Degree of

MASTER OF SCIENCE

GEOSCIENCES AND PETROLEUM ENGINEERING

UNIVERSITI TEKNOLOGI PETRONAS

BANDAR SERI ISKANDAR,

PERAK

JANUARY, 2011

DECLARATION OF THESIS

Title of thesis

DOLOMITIZATION IN MIOCENE CARBONATE PLATFORMS
OF CENTRAL LUCONIA, SARAWAK: CHARACTER, ORIGIN,
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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)

ACKNOWLEDGEMENT

Alhamdulillah, I praise Allah, God the Almighty for giving me help in extending my energy and motivation to finish this study. This study has benefited from the funding provided by Shell Company via Shell Chair Professor at Universiti Teknologi PETRONAS. I would like to extent my gratitude to several people/parties, without whom I would probably never be in this stage.

1. My wife Maghfiroh Puji Astuti and my daughter Aqila Sekar Kinasih for always being there with great love and patience, relieving every moment-of-reluctant I had, through hard times of being alone when I had to stay at the campus. This is for both of you, and promise, enough for ‘adventuring life itinerary’, no more aspiration for PhD, time to earn money and achieve a real life.
2. My parents for always giving me some ‘healing motivation’ in the midst of every suffering seconds of working out on this thesis. Thank you mom & dad!
3. My supervisor, Prof. Bernard J. Pierson, for being a great mentor, for sharing his ideas and suggestion, encouragements, financial support, for giving me endless motivational words and believing that I will manage to be at the very final stage of this academic journey.
4. PETRONAS for giving permission to use all the data. Special credit goes to Mr. Mohammad Yamin Ali of PRSB for sharing his work results and ideas on the sedimentology aspects and dolomitization in Central Luconia.
5. Sarawak Shell Berhad (SSB) for allowing me to use the core data, providing thin sections of excellent quality, and permission on assessing some confidential reports. Special thanks go to Maarten Weimer and his team (among others are Yussop Sulaiman and Kelly Maguire) for providing every single help since the very beginning phase of this project. I would like to

dedicate also my gratitude to other colleagues in SSB: Jean-Michel Gehenn and Ting King King for providing me secondary data and important reports.

6. Eduard Kosa and Jonny Guddingsmo for their constructive suggestion and critical reviews on the content of this research and the interpretation I made.
7. Prof. Rudy Swennen for giving me a 'rare' opportunity to carry out part of research steps in the University of Leuven, for introducing me to the 'captivating world of dolomite research', for sharing critical ideas and constructive criticism that help me shape up the interpretation and the conclusions made during the study.
8. Mr. Zaidi bin Mohd. Hassan for his permission on using petrographic microscope at Jabatan Mineral and Geosains, Ipoh. Noor Akhmar Kamarudin for giving such a great help in geochemical analysis and also for being a 'great colleague and friend' during the finishing stage.
9. Prof. Peter K. Swart from University of Miami, for fruitful discussion on the stable isotope interpretation during my short visit at RSMAS, for giving me a valuable book from his personal collection and some important papers on the dolomitization phenomena in the Great Bahama Bank.
10. Dr. Georg Warrlich for sending me his paper work considering the dolomitization on E11.
11. Aryo H.P. (EE Dept. UTP) for helping me in capturing some great photographs of the core plugs.
12. Hilfan, Adi, Eko, Maman, Luan, Septian for such a great friendship and many help during my study in UTP. Special credit goes to Hilfan Khairy who has lent me his laptop so I was able to print the final version of this thesis.
13. My colleagues at SEACARL: Aicha, Ani, Dedeche, Habib, Haylay, Hissein, Jasmin, Sara, Syazwani, and Solomon for every special hectic days and long-night shared.

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 reservoir 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 $< 10 \mu\text{m}$ to $180 \mu\text{m}$.

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 adalah planar euhedral, dengan hanya sedikit bahagian yang mengandungi kristal subhedral yang terbentuk pada bahagian yang dalam di platform selatan. Saiz kristal berjulat daripada $< 10 \mu\text{m}$ sehingga $180 \mu\text{m}$.

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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