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INVESTIGATION OF OXYGEN IN RED BLOOD CELLS USING NMR TECHNIQUES

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การศึกษความสัมพันธ์ระหว่างค่า spin-lattice (T_1) และ spin-spin (T_2) relaxation times และออกซิเจนในสารละลายโดยการวัดค่า T_1 และ T_2 ของสารละลาย phosphate buffer saline (PBS) พบว่าการเปลี่ยนแปลงของค่า T_1 ขึ้นกับออกซิเจนจากการทดลองวัดค่า T_1 และ T_2 ของสารละลายเซลล์เม็ดเลือดแดงความเข้มข้นต่างๆ ที่เวลาต่างๆ พบว่าการเปลี่ยนแปลงของ T_1 ขึ้นกับการใช้ออกซิเจนของเซลล์เม็ดเลือดแดงและปริมาณของเซลล์เม็ดเลือดแดง ขณะที่การเปลี่ยนแปลงของค่า T_2 ขึ้นกับปริมาณเซลล์เม็ดเลือดแดง ความสัมพันธ์ของการเปลี่ยนแปลงค่า T_1 และปริมาณออกซิเจนที่เซลล์เม็ดเลือดแดงใช้เป็นแบบเส้นตรงและอาจเขียนอยู่ในรูปสมการความสัมพันธ์ได้ ส่วนความสัมพันธ์ระหว่างอัตราการเกิด spin-spin relaxation และปริมาณเซลล์เม็ดเลือดแดงเป็นแบบเส้นตรง จากความสัมพันธ์ทั้งสองจึงอาจนำเทคนิคทางเอ็นเอ็มอาร์ทั้งสองแบบมาประยุกต์ใช้หาปริมาณออกซิเจนในเซลล์เม็ดเลือดแดงได้

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KEY WORD : SPIN-LATTICE RELAXATION TIME, SPIN-SPIN RELAXATION TIME, OXYHEMOGLOBIN, RED BLOOD CELLS

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In the study of relationship between spin-lattice (T_1) and spin-spin (T_2) relaxation times and dissolved oxygen, T_1 and T_2 values of phosphate buffer saline solutions (PBS) were measured. The result indicated that only T_1 was oxygen-dependent. The results from measurement of T_1 and T_2 of the dissolved oxygen solutions containing different quantity of red blood cells at some measured times indicated that T_1 depended on oxygen consumption of red blood cells and the quantity of red blood cells while T_2 depended on the quantity of red blood cells. Regression-analysis, the relationship between T_1 change and the quantity of oxygen consumption of red blood cells was linear and could be presented in the form of equation and rate of spin-spin relaxation was linear relationship with percentage of red blood cells. Accordingly, proton relaxation times could be applied in the investigation of oxygen consumption of red blood cells.

ภาควิชา.....เคมี..... ลายมือชื่อนิสิต
สาขาวิชา.....เคมี..... ลายมือชื่ออาจารย์ที่ปรึกษา
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