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THE STUDY OF COMPLEX FORMATIONS BETWEEN ESSENTIAL AMINO ACIDS
AND SOME METAL IONS BY ELECTROCHEMICAL METHODS

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หัวข้อวิทยานิพนธ์	การศึกษาการเกิดสารประกอบเชิงซ้อนระหว่างกรดอะมิโนที่จำเป็นกับฮิออนของโลหะบางชนิดโดยวิธีเคมีไฟฟ้า
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บทคัดย่อ

วิทยานิพนธ์นี้เป็นการศึกษาการเกิดสารประกอบเชิงซ้อนระหว่างกรดอะมิโนที่จำเป็นสำหรับมนุษย์ 8 ชนิด คือ แอล-ไอโซลูซีน แอล-ลูซีน แอล-โลซีน แอล-เมธิโอนีน แอล-เฟนิลอะลานีน แอล-ธรีโอนีน แอล-ธรีโทแฟน และแอล-วาซีน กับฮิออนของโลหะทรานซิลิกนคือแมงกานีส (II) แคดเมียม (II) และ ตะกั่ว (II) ซึ่งคัดเลือกมาจากแถวที่ 1, 2 และ 3 ตามลำดับ โดยเทคนิคทางเคมีไฟฟ้า 2 เทคนิค คือการดิเรตแบบวัดพีเอช และโพลาริกราฟี สภาวะการทดลองที่ใช้คือ ฮีออดิกสเตร็งค์คงที่ในสารละลายโพแทสเซียมคลอไรด์ เข้มข้น 0.10 โมลาร์ และอุณหภูมิคงที่ที่ 37.0 ± 0.5 องศาเซลเซียส โดยเทคนิคการดิเรตแบบวัดพีเอช พบว่า ค่าคงตัวของเสถียรภาพขั้นที่ 1 และ 2 คือ K_1 และ K_2 อยู่ในอันดับเจ็ด (10^7) และอันดับหก (10^6) ตามลำดับ สำหรับสารประกอบเชิงซ้อนของแคดเมียม (II)-กรดอะมิโนที่จำเป็น ค่าคงตัวของเสถียรภาพขั้นที่ 1 คือ K_1 อยู่ในอันดับสาม (10^3) สำหรับสารประกอบเชิงซ้อนของแมงกานีส (II)-กรดอะมิโนที่จำเป็น และเกิดตะกอนสำหรับระบบของตะกั่ว (II)-กรดอะมิโนที่จำเป็น โดยเทคนิคโพลาริกราฟีพบว่า โคออดิเนชันนัมเบอร์ของแคดเมียม (II)-กรดอะมิโนที่จำเป็น มีค่าเป็น 1 และ 2 ตรงกับสารประกอบเชิงซ้อน 1:1 และ 1:2 โดยค่าคงตัวของเสถียรภาพคือ $\log \beta_1$ และ $\log \beta_2$ อยู่ในช่วง 8 และ 15 ตามลำดับ โคออดิเนชันนัมเบอร์มีค่าเป็น 1 ตรงกับสารประกอบเชิงซ้อน 1:1 ของแมงกานีส (II)-กรดอะมิโนที่จำเป็น และตะกั่ว (II)-กรดอะมิโนที่จำเป็น โดยค่าคงตัวของเสถียรภาพคือ $\log \beta_1$ อยู่ในช่วง 3 และ 4 ตามลำดับ การเปรียบเทียบค่าคงตัวของเสถียรภาพจากเทคนิคทั้งสองสอดคล้องกันเป็นอย่างดี และค่าเหล่านี้ลดลงตามลำดับคือ แคดเมียม > ตะกั่ว > แมงกานีส

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ABSTRACT

In this thesis, the complex formations between the 8 essential amino acids for human namely L-isoleucine, L-leucine, L-lysine, L-methionine, L-phenylalanine, L-threonine, L-tryptophan and L-valine with the interesting transition metal ions, Mn(II), Cd(II) and Pb(II) ion, sampled representatively from the first, second and the third rows, respectively, were investigated by two electrochemical techniques, pH-metric titration and polarography. The experimental conditions used were the constant ionic strength of 0.10 M KCl and the constant temperature of $37.0 \pm 0.5^{\circ}\text{C}$. By pH-metric titration technique, the stepwise stability constants, K_1 and K_2 respectively, were found to be in the order of seventh and sixth for the Cd(II)-essential amino acid complexes. The stability constants, K_1 , were found to be in the order of third for the Mn(II)-essential amino acid complexes and the precipitate was taken place for the Pb(II)-essential amino acid systems. By polarographic technique, the coordination numbers of the Cd(II)-essential amino acid were found to be 1 and 2 corresponding to the 1:1 and 1:2 complexes with the stability constants, $\log \beta_1$ and $\log \beta_2$ respectively, of the range of

8 and 15. The coordination number was found to be 1 corresponding to the 1:1 complexes of Mn(II)-essential amino acid and Pb(II)-essential amino acid with the stability constants, $\log \beta_1$, of the range of 3 and 4, respectively. The comparison of the stability constants determined from two techniques was generally in good agreement and these values decreased in the following order; Cd > Pb > Mn.



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