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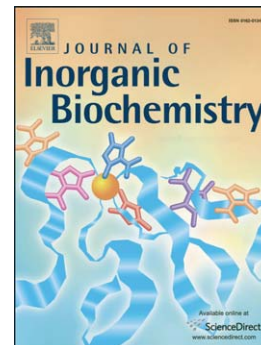
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PII: S0162-0134(16)30238-0  
DOI: doi: [10.1016/j.jinorgbio.2016.08.011](https://doi.org/10.1016/j.jinorgbio.2016.08.011)  
Reference: JIB 10066

To appear in: *Journal of Inorganic Biochemistry*

Received date: 29 March 2016  
Revised date: 23 August 2016  
Accepted date: 25 August 2016



Please cite this article as: Shuntaro Takahashi, Sudipta Bhowmik, Naoki Sugimoto, Volumetric analysis of formation of the complex of G-quadruplex DNA with hemin using high pressure, *Journal of Inorganic Biochemistry* (2016), doi: [10.1016/j.jinorgbio.2016.08.011](https://doi.org/10.1016/j.jinorgbio.2016.08.011)

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# Volumetric analysis of formation of the complex of G-quadruplex DNA with hemin using high pressure

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Keywords: G-quadruplex, Thermodynamics, Hemin, Pressure, Molecular Crowding

## ABSTRACT

DNA guanine-quadruplexes (G-quadruplexes) complexed with the Fe-containing porphyrin, hemin (iron(III)-protoporphyrin IX), can catalyze oxidation reactions. This so-called DNAzyme has been widely used in the field of DNA nanotechnology. To improve DNAzyme properties, we sought to elucidate the interaction mechanism between G-quadruplex DNA and hemin. Here, we performed volumetric analyses of formation of the complex between an oligonucleotide with the sequence of human telomeric DNA (h-telo) and hemin. The G-quadruplex DNA alone and the G-quadruplex DNA-hemin complex were destabilized with increasing pressure in Na<sup>+</sup> buffer. The pressure required to destabilize the h-telo-hemin complex was less in K<sup>+</sup>-containing buffer than in buffer with Na<sup>+</sup>, which indicates that there was a smaller volumetric change upon h-telo formation in K<sup>+</sup> buffer than in Na<sup>+</sup> buffer. The calculated change in h-telo-hemin binding volume ( $\Delta V_b$ ) in the Na<sup>+</sup> buffer was 2.5 mL mol<sup>-1</sup>, whereas it was -41.7 in mL mol<sup>-1</sup> the K<sup>+</sup> buffer. The DNAzyme activity in the K<sup>+</sup> buffer was higher than that in the Na<sup>+</sup> buffer at atmospheric pressure. Interestingly, the pressure effect on the destabilization of the h-telo-hemin complex in the presence of poly(ethylene glycol)200

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