World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:16, No:08, 2022

Interaction of Hemoglobin with Sodium Dodecyl Sulfate and Ascorbic Acid: A Chemometrics Study

Authors : Radnoosh Mirzajani, Ebrahim Mirzajani, Heshmatollah Ebrahimi-Najafabadi

Abstract : Introduction: Hydrogen peroxide can be produced over the interaction of sodium dodecyl sulfate (SDS) with hemoglobin which would facilitate the oxidation process of hemoglobin. The presence of ascorbic acid (AA) can hinder the extreme oxidation of oxyhemoglobin. Methods: Hemoglobin was purified from blood samples according to the method of Williams. UV-V is spectra of Hb solutions mixed with different concentrations of SDS and AA were recorded. Chemical components, concentration, and spectral profiles were estimated using MCR-ALS techniques. Results: The intensity of soret band of OxyHb decreased due to the interaction of Hb with SDS. Furthermore, changes were also observed for peaks at 575 and 540. Subspace plots confirm the presence of OxyHb, MetHb, and Hemichrom in each mixture. The resolved concentration profiles using MCR-ALS reveal that the mole fraction of OxyHb increased upon the presence of AA up to a concentration level of 3 mM. The higher concentration of AA shows a reverse effect. AA demonstrated a dual effect on the interaction of hemoglobin with SDS. AA disturbs the interaction of SDS and hemoglobin and exhibits an antioxidative effect. However, it caused a tiny decrease in the mole fraction of OxyHb. Conclusions: H2O2 produces upon the interaction of OxyHb with SDS. Oxidation of OxyHb facilitates due to overproduction of H2O2. Ascorbic acid interacts with H2O2 to form dehydroascorbic acid. Furthermore, the available free SDS was reduced because the Gibbs free energy for micelle production of SDS became more negative in the presence of AA.

Keywords : hemoglobin, ascorbic acid, sodium dodecyl sulfate, multivariate curve resolution, antioxidant
Conference Title : ICMBBB 2022 : International Conference on Molecular Biology, Biochemistry and Biotechnology
Conference Location : Vancouver, Canada
Conference Dates : August 08-09, 2022