Nanoscaled Polysaccharides in Solution:

Scaling Laws of Hyaluronan

Tahani Alfazan*, Fathi Elashhab, Lobna Sheha, Abdelsallam EA Youssef, Randa Elsupikhe

Chemistry Department, Faculty of Science, University of Benghazi, Benghazi.
* Corresponding author email: tahanialfazani 19@gmail.com

Abstract

Ionic polysaccharides (e.g. hyaluronan (HA)) are currently used in a range of sizes, or molar masses, in an increasing number of nanomaterials for biocompatible applications. The aim of this work is to predict the scaling law of HA, in aqueous salt solution, by applying simple and low-cost methods of green degradation and molar mass determination. In this respect, moderately concentrated solutions of native and different ultraviolet (UV) -degraded HA in NaCl aqueous solution were prepared. The corresponding molar masses were obtained via one-point method of viscosity measurements. It has been observed that the progress of molar mass production, via HA degradation, was UV-dose dependent. The graphical interpretation method of kinetic analysis confirmed the first order degradation rate, which is an indication of a random session on the glycosidic bonds. The viscosity data were treated via Flory-Fox's theory to get molecular parameters such as: the hydrodynamic radius ($R_{H,\eta}$), radius of gyration ($R_{G,\eta}$), coil density ($\rho_{coil,\eta}$), critical concentration (C_η^*) and second virial coefficient ($A_{2,\eta}$). It has been found that: $R_{H,\eta}$ and $R_{G,\eta}$ were UV-dose decreases; while $\rho_{coil,\eta}$, C_η^* and $A_{2,\eta}$ were UV-dose increases. The results were explained according to the influence of size and excluded-volume.

Keywords: Intrinsic viscometery, Molecular parameters, Size modification, UV- degradation rate

Professor Fathi Elashhab: CV-2018

Full name: Fathi Shaker Mohamed Elashhab. **Scientific Degrees:** PhD-Phys Chem, 1989, NUI/UCD,Dublin; MSc-Phys Chem, 1981, H-W, Edinburgh; Dip-Chem Analys, 1979, Cairo, Cairo; BSc-Chem, 1977, Cairo, Cairo. **Languages:** Arabic (native), English (fluent), Greek (little). **Contact:** Mobile: 0925109860; Emails: fathi.elashhab@uob.edu.ly. **Nationality and birth:** Libyan; Marj (Barga), Libya, 11.9.1952 **Family:** Married to Prof Lobna Sheha (Egyptian), 3 children. **Social activity:** Benghazi boy scout. **Roots:** Elashhab **(zliten)**, Hemidy**(Gharyan)**, Sokfi**(Tlemcen)**, Edrisi**(Fes)**, Hasni**(Almadina)**, Hashemi**(Meka)**. **Cultural interest:** Fine arts, Light and classical music; Greek mythology; history and philosophy of science. **Intellectual heritage:** Dr Zaki N Mahmoud, Bertrand Russell and Charles Peirce. Job experience: Phys chem faculty member at Unversity of Benghazi (1982-Present); Editor in chief of J Sci App (2005-January 2017); 16 MSc-dissertations, 56 publications and presentations. **Research interest:** Nanoscaled polysaccharides in solution: irradiation modification of size-transport relationships. **Last publication: Elashhab F**, Sheha L, Youssef A, Khalaf H

