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Resveratrol-Induced Augmentation of Telomerase Activity

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Abstract

Cells age and lose their capacity to divide as their telomere length gets shortened each timethey divide, eventually leading to the stoppage of cell division. This is primarily the reasonfor aging of an organism. Telomeres are thousands of repeated sequences that protects thechromosome ends from DNA damage. Each time a cell divide, some part of the telomere islost due to the inability of DNA polymerase to replicate the end of the chromosome (the end replication problem) during lagging strand synthesis. As a result, most cells (includinghuman cells) can divide only up to a certain amount of division (50-70) before goingsenescent phase, a phenomenon known as Hayflick limit. Telomerase is an enzyme that canextend the telomere length and 'repair' the ends of chromosomes. It consists of twomolecules each of human telomerase reverse transcriptase (TERT), telomerase RNA (TR orTERC), and dyskerin (DKC1). TERT is a reverse transcriptase, which is a class of enzymethat creates single-stranded DNA using single-stranded RNA as a template. The enzymeworks by binding to a telomerase RNA molecule that contains a sequence complementary tothe telomeric repeat. It then extends the overhanging strand of the telomere DNA using thisRNA as a template. After that, DNA polymerase adds complementary strands to theoverhang producing double-stranded DNA. Various factors are known to affect the activityof telomerase enzyme. Thus, strategies for improving the activity of telomerase can increasethe telomere length and thereby increase the overall lifespan of the individual. The currentstudy intended to compare the different bioactive compounds that affect telomerase enzymevia docking and to optimise its usage. It has been found that the compound "resveratrol"showed the highest binding affinity towards telomerase.

Keywords: Telomeres; Hayflick limit; resveratrol

Compressibility Factor of Nanoconfined Alkane along Vapor-liquidCoexistence

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Abstract

The fluid PVT properties have direct influence on the fluid compressibility factor (Z-factor). Thecommon sources of Z-factor values are experimental measurements, equation of states andempirical correlations. Moreover, these equations of states and correlations are applicable to thebulk fluid and not suitable for the fluids confined at nanoscale. In the current work,compressibility factor of saturated liquid (Z l) and saturated vapor (Z g) of nanoconfined alkanesare estimated using the simulation data obtained from the Monte Carlo simulations. Thisinvestigation indicates that with increase in temperature compressibility factor of saturated liquidincreases and the compressibility factor of saturated vapor decreases for all studied nanoporewidths. Critical compressibility factors (Z c) of nanoconfined alkanes are also estimated using thecritical point data obtained from simulations. The Z c of nanoconfined alkanes reveals non-monotonic trend with inverse pore width (1/H) and approaches to the bulk value at highernanopore width. Moreover, with decrease in nanopore width, Z c decreases and finally remainsindifferent in quasi-2D region of nanopore width. A typical variation of Z c with inverse ofnanopore width (1/H) for nanoconfined methane and n-butane are shown in the following figure.

Keywords: compressibility factor; nanoscale; nanoconfined alkanes, Monte Carlo simulation.