Stabilizacija lizozima u niskotemperaturnim eutektičkim otapalima na bazi osmolita

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Stabilizacija lizozima u niskotemperaturnim eutektičkim otapalima na bazi osmolita

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Sažetak: Proučavanjem živih sustava identificiran je specifičan mehanizam zaštite organizma u stresnim uvjetima koji se oslanja na male neutralne i netoksične molekule poznate pod imenom osmoliti. Osmoliti, osim što djeluju kao obrambeni mehanizam, imaju ključnu ulogu u održavanju termodinamičke stabilnosti biomakromolekula bez narušavanja njihove funkcionalnosti. S obzirom da se smatraju "kompleksnim adaptivnim sustavima" koje karakteriziraju emergentna svojstva, nedavno je otkrivena povezanost sa niskotemperaturnim eutektičkim otapalima koja učinkovito repliciraju prirodno okruženje različitih biomolekula, a ujedno imaju slična svojstva osmolita. U ovom radu su pripremljena niskotemperaturna eutektička otapala na bazi osmolita čija je struktura identificirana infracrvenom spektroskopijom sa Fourijerovom transformacijom, te je provedena karakterizacija njihovih svojstava. Također je ispitan utjecaj osmoDES-ova na termodinamičku stabilnost proteina lizozima pri ekstermnim temperaturama, te na toplinski induciranu agregaciju lizozima. S obzirom na rezultate, pripremljeni osmoDES-ovi pokazuju značajan potencijal u očuvanju stabilnosti biomakronolekula te primjeni kao medija za pohranu u usporedbi sa konvencionalnim puferima.

Ključne riječi: *osmoliti, niskotemperaturna eutektička otapala, stabilizacija proteina, agregacija*

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Stabilization of lysozyme in low-temperature eutectic solvents based on osmolytes

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Abstract: By studying living systems, a specific mechanism for protecting the organism in stressful conditions has been identified, which relies on small neutral and non-toxic molecules known as osmolytes. Osmolytes, in addition to acting as a defensive mechanism, play a key role in maintaining the thermodynamic stability of biomacromolecules without compromising their functionality. Since they are considered as "complex adaptive systems" characterized by emergent properties, a recent connection with low-temperature eutectic solvents has been discovered, which effectively replicate the natural environment of different biomolecules while also having similar properties to osmolytes. In this study, low-temperature eutectic solvents based on osmolytes were prepared, whose structure was identified by infrared spectroscopy with Fourier transformation, and their properties characterized. The impact of osmoDESs on the thermodynamic stability of lysozyme proteins at extreme temperatures, as well as on the heat-induced aggregation of lysozymes, was also examined. Given the results, prepared osmoDESs show significant potential in preserving the stability of biomacromolecules and their application as a medium for storage compared to conventional buffers.

Keywords: *osmolytes, low temperature deep eutectic solvents, protein stabilisation, aggregation*

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