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HYDROTHERMAL SYNTHESIS OF OLIGOGLYCINES WITH ADIABATIC EXPANSION COOLING

Yasuhiro Futamura (futamura@nih.go.jp) and Kenji Yamamoto (backen@ri.imcj.go.jp)

Research Institute, International Medical Center of Japan, 1-21-1 Toyama, Shinjuku, Tokyo 162-8655, Japan and Department of Bioactive Molecules, National Institute of Infectious Diseases, 1-23-1 Toyama, Shinjuku, Tokyo 162-8640, Japan

All of the biopolymers like proteins, nucleic acids and polysaccharides are composed of monomer units connected by covalent bonds via dehydration condensation. There have been several studies on biopolymer synthesis under hydrothermal conditions. Shock previously reported that the thermodynamic equilibrium of condensation/ hydrolysis reactions between glycine (Gly) and diglycine (Gly_2) would shift to the dehydration condensation as the temperature increased[1]. This report suggests that rapid quenching, that is non-equilibrium thermodynamics system, could avoid hydrolysis of the oligomers that had already been synthesized under hydrothermal conditions.

We designed a novel hydrothermal flow reactor with adiabatic expansion cooling, which was thought to be one of the most rapid quenching methods[2]. After aqueous solutions of monomers were treated at high temperature and pressure, they were released into the atmosphere through an orifice to be depressurized and cooled down simultaneously with the Joule-Thomson effect. Using the flow reactor, we have demonstrated oligomerization of glycine up to decamer (Gly_{10}), which had never been yielded with any other quenching methods.

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[1] Shock, E. L. (1992) "Stability of peptides in high-temperature aqueous solutions" *Geochim. Cosmochim. Acta*, **56**, 3481-3491.

[2] Goto, T., Futamura, Y., Yamaguchi, Y. & Yamamoto, K. (2005) "Condensation reactions of amino acids under hydrothermal conditions with adiabatic expansion cooling" *J. Chem. Eng. Jpn.*, in press. (http://www.jstage.jst.go.jp/browse/jcej/)