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P42

DECOMPOSITION OF OLIGOGLYCINE UNDER GENTLE NONEQUILIBRIUM ENVIRONMENTS

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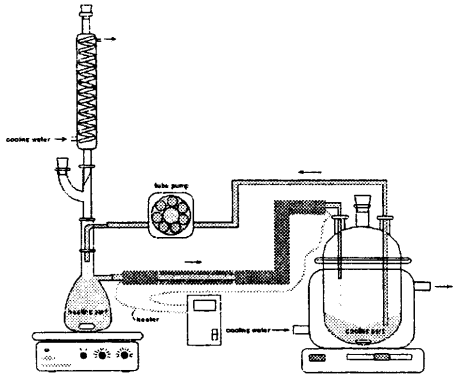
For substances to acquire energy which is necessary for their chemical evolution, nonequilibrium environments are essential. Imai et al. have been demonstrated that amino acids polymerize due to local heat gradient in a flow reactor simulated submarine hydrothermal system (Science, 1999). However, such environments involve not only polymerization of amino acids, but also decomposition of oligomers. We expected that gentle environmental change is required for father evolution of substances produced under rapid environmental changes. Therefore, we assumed marine environment in the vicinity of submarine hydrothermal vents and constructed a flow reactor. We report that decomposition rate of oligoglycine under gentle nonequilibrium environments is different from it under steady environment.

We constructed a flow reactor operated under atmospheric conditions as figure shows. The flow reactor has a hot section (100℃) and a cold section (4℃), and reaction solution cycles between them. A reactor heated at constant temperature was prepared as a control experiment. Reaction solution dissolved from monomer to hexamer of glycine in pure water is prepared. A small amount of reaction solution are collected at specified time intervals and analyzed with HPLC. As the results, all oligomers from triglycine to hexaglycine were decomposed gradually. And the reaction rates were different between two kinds of reactors. Especially, triglycine was decomposed most rapidly in all kinds of oligomer and was decomposed slowly in the flow reactor than steady reactor only initial stage. When the reaction solution heated at below 70℃, oligoglycine was not decomposed. These results suggest that oligomers under nonequilibrium environment are easy to maintain their structures.



Figure