

DIKETOPIPERADINE MEDIATED PEPTIDE FORMATION  
IN AQUEOUS SOLUTION

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Diketopiperadines (DKP) are formed in most experiments concerning the prebiotic peptide formation, but the molecules have not been paid attention in the studies of chemical evolution. We have investigated the formation of oligopeptide from amino acid and glycine anhydride as a DKP or the elongation of oligoglycine with the DKP.

Aqueous mixed solutions of 0.5 M glycine anhydride and 0.5 M of glycine, diglycine or triglycine were allowed to react at 90°C and at several pH. The formations of triglycine, tetraglycine, and pentaglycine, respectively, were confirmed by HPLC with ninhydrin reaction system, and the yields of them were 0.8, 2.6, and 9.2%, respectively, in the case of pH 7, 15 hr heating. A similar experiment with alanine and the DKP resulted in the formation of glycyglycylalanine. The results indicate that the formation or the elongation of the peptides proceed through the nucleophilic attack of amino-group of the amino acids or the oligoglycines on the DKP accompanied by the ring-opening.

The formation of oligoglycines was also found to proceed in aqueous solution of urea and glycine in the open system to allow the evaporation of ammonia. The formation of glycine anhydride, di-, tri-, and tetraglycine was observed.

A possible pathway is proposed for prebiotic peptide formation on the primitive Earth.