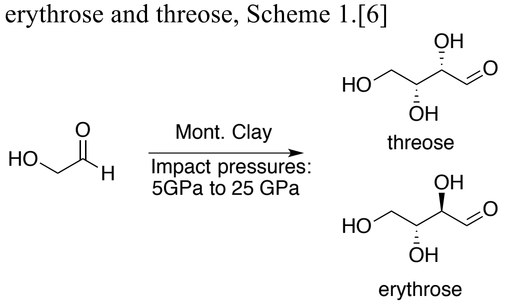
SHOCK CHEMISTRY OF SUGAR PRECURSORS: STEREOCHEMICAL CONSIDERATIONS. V. P. McCaffrey[1] and N. E. B. Zellner[2], [1]Department of Chemistry, Albion College, Albion MI 49224, vmccaffrey@albion.edu, [2]Department of Physics, Albion College, Albion MI 49224, nzellner@albion.edu.

The identification of a wide array of organic compounds in meteorites (including the Murchison and Murray meteorites [1]) and comets [2] has spurred interest in the field of prebiotic chemistry. Several reports have suggested that these bodies could have delivered many of these biologically relevant molecules to an early Earth.[3] Simulated impact experiments have shown that many classes of compounds, including PAHs [4] and amino acids [5], both survive the impact event and also undergo significant reactions include polymerizations. For example, Bertrand *et al.* have shown that amino acids can be recovered from impact experiments with pressures up to 29 GPa and dipeptides are created in the shock.[5] They also found that a significant amount of racemization of the parent amino acid occurred. Previous work from our lab has shown that glycolaldehyde undergoes similar reactions when stabilized by Montmorillonite clay in impact experiments up to 25 GPa to form the four carbon sugars erythrose and threose, Scheme 1.[6]



Scheme 1: Reaction of glycolaldehyde showing the formation of threose and erythrose.

In the analyses of these samples, a strong preference was found for the formation of threose over erythrose (approximately 9:1 threose to erythose at all impact pressures). The diastereomeric excess in the reaction was surprising, but a recent review by Cleaves *et al*. outlines the many enantioselective reactions that can be catalyzed by mineral surfaces.[7] In this work, we will present result that will help explain the preference for the synthesis of erythrose over erythrose in the impact experiments.

In addition, we will present the results of laboratory impact experiments where dihydroxyacetone and mineral matrices (analogues for the Murchison meteorite) were subjected to reverberated shocks from 5 GPa to >25 GPa. We will compare these results to the solution and solid phase reactivity of DHA in the absence of the shock event. Our results show that the production of larger molecules (with 4, 5 and 6 carbons) is accelerated under the conditions that simulate meteoric impacts and include the mineral matrix.

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