The Effect of Pressure, and Formation of new Polymorphs of the Amino Acids L-cysteine and L-serine

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The application of pressure (<10 GPa) has proved a successful way of probing materials, particularly biologically important building blocks such as amino acids to understand the significance of hydrogen bonding interactions in these simple organic molecules [1].

On application of pressure, even systems comparable to each other have been shown to have remarkably different properties. Orthorhombic L-cysteine and L-serine-I, both of which have similar packing arrangements are examples of this. Under pressure, L-cysteine initially undergoes a much larger reduction in volume than L-serine-I, until at much higher pressure (c.a. 4 GPa) a single-crystal to single-crystal phase transition was observed. L-serine-I also undergoes a similar phase transition (c.a 5 GPa) [2], however, although both phase transitions in L-serine-I and orthorhombic L-cysteine occur through the compressibility of soft interactions, the resulting high-pressure polymorphs are far different.

Pressure studies between ambient and 10 GPa are not only providing a useful way to investigate polymorphism of materials, but the information obtained on increasing pressure is beginning to give us an appreciation of the compressibility of intermolecular interactions under these pressure.

[1] Dawson A., Allan D.R., Clark S.J., Belmonte S.A., David W.I.F., McGregor P.A., Parsons S., Pulham C.R., Sawyer L., 2005, a*ccepted for publication*. [2] Moggach S., Morrison C.A., Allan D.R., Parsons S., Sawyer L., *Acta Cryst*., 2005, **B61**, 58-68.

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