placed until it forms a new, reactive ground state in which polymerization can occur. As we have indicated, many electron donors such as pyrene, perylene, and anthracene form complexes with acceptors like iodine, tetracyanoethylene, or chloranil which have low lying excited states that shift to lower energy with increasing pressure. At high pressure all these systems are relative and form new products which may or may not include the acceptor. Clearly, however, the major function of the acceptor is to provide an excited state sufficiently low in energy that one can create a reactive ground state for the donor at high pressure. Perhaps one could design electron donor–acceptor complexes with appropriate geometry and electronic structure so that one could induce different desired reactions and thus create a chemistry of the organic solid state at high pressure.

Possibly, a special case of this phenomenon is the collapse of graphite[2,20,24–26] to hexagonal diamond at high pressure, where the molecular (van der Waals) forces between graphite layers are replaced by new covalent bonds.

While these events at high pressure have widely different characteristics they share the feature that a new ground state is created. Transitions involving metals tend to occur discontinuously and reversibly. Where the transition involves local strain which may perturb neighboring sites, the process may occur over a considerable range of pressure and involve significant hysteresis. These new ground states may have distinctly different chemical and physical properties.

In summary, the basic effect of pressure is increased orbital overlap. A general result of this overlap is the shift of one type of orbital with respect to another. Where different electronic states do not differ too greatly in energy, this shift in orbital energy may create a new ground state for the system. Electronic transitions, so defined, are not an uncommon phenomenon in metals and in ionic, covalent, and molecular crystals. In fact, perhaps the major interest in exploratory research at very high pressure is in investigating the nature of the new ground states created by orbital overlap.

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