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A New Carbon Phase Constructed by Long-Range Ordered Carbon Clusters form Compressing C_{70} Solvates WEN CUI, MINGGUANG YAO, SHIJIE LIU, FENGXIAN MA, QUANJUN LI, RAN LIU, BO LIU, BO ZOU, TIAN CUI, BINGBING LIU[1], Jilin University, STATE KEY LAB OF SUPERHARD MATERIAL COLLABORATION — A novel carbon material has been recently reported from compressing C_{60} solvates (C_{60}/m-xylene) and the obtained high pressure phase–the ordered amorphous carbon cluster (OACC) structure, breaks our inherent understanding of the categorization of various phases and adds a new member to the list of structures [L. Wang et al, Science 337, 825 (2012)]. Our study reveals that m-xylene plays an important role in both the structure and property of the formed novel phase [MG. Yao et al, App Phys Lett 103, 071913 (2013)]. Here, another example of OACC is also presented from compressing C_{70} / m-xylene in which amorphized and highly compressed C_{70} units act as building blocks. The high pressure phase is exceptional incompressible, which can indent the (100) face of diamond. A new phase transition occurs in the compression process, which is very different from compressing C_{60}/m-xylene, indicating OACC structure can be tuned by changing the initial fullerene molecules. The deformation of fullerene molecules under pressure and the formation mechanism of the high pressure hard phase have also been revealed in this study. Our study extends the OACC structure to larger fullerenes and suggests a universal rule for the high pressure behaviors of lower symmetry systems of solvated fullerenes [W. Cui et al, Adv Mater 26, 7257(2014)].

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