Supporting Information

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Table S1. Similarities between fcc-Cu and Cu_2O with the proposed *n*-diamond and *i*-carbon structures

"*n* diamond"						fcc-Cu space group 225 $a = 3.6149$ Å		Cu_2O space group 201 $a = 4.266$ Å		"*i* carbon"			
Indices	Calculated, Å*	Reported, Å (1)	Reported, Å (2)	Reported, Å (3, 4)	Reported, Å (5)	Indices	Calculated, Å	Indices	Calculated, Å (6)	Reported, Å (1)	Reported, Å (2)	Reported, Å (3)	Reported, Å (4)
111	2.053	2.08	2.10	2.06	2.067	111	2.087	110	3.020	3.04	3.02	3.03	3.04
200	1.778	1.80	1.81	1.78	1.791	200	1.808	111	2.463	2.55	2.48	2.49	2.42
220	1.257	1.28	1.28	1.26	1.261	220	1.278	200	2.133	2.12	2.12	2.13	2.08
311	1.072	1.09	1.09	1.07	1.078	311	1.090	211	1.742	1.82	1.77	1.78	1.70
222	1.027	1.05	1.05	1.04	1.032	222	1.044	220	1.510	1.51	1.51	1.59	1.49
400	0.889	0.903		0.898	0.892	400	0.904	311	1.286	1.30	1.29	1.29	1.26
331	0.816	0.824	0.829	0.818	0.817	331	0.830	222	1.232				1.19
420	0.795	0.808	0.808	0.796	0.796	420	0.808	400	1.067	1.10		1.09	
422	0.726	0.735		0.726	0.727	422	0.738	331	0.978			1.05	
511/333	0.684	0.673		0.683 (4)	0.686	511/333	0.695	420	0.954			0.916	
440	0.629				0.630	440	0.639	422	0.870	0.906		0.847	
531	0.601				0.601	531	0.611	511	0.821	0.835			
600/420	0.593					600/420	0.603						
620	0.562					620	0.571						
533	0.542					533	0.551						
622	0.536					622	0.545						
444	0.513					444	0.522						
551/711	0.498					551/711	0.506						

*3C diamond reflections including kinematically forbidden reflections.

1. Yamada K, Sawaoka AB (1994) Very small spherical crystals of distorted diamond found in a detonation product of explosive/graphite mixtures and their formation mechanism. *Carbon* 32:665–673.
2. Burkhard G, et al. (1994) Carbon phase transition by dynamic shock compression of a copper/graphite powder mixture. *Jpn J Appl Phys* 33:L876–L879.
3. Djerdj I, et al. (2006) Transmission electron microscopy study of carbon nanophases produced by ion beam implantation. *Mat Sci Eng C-Bio S* 26:1202–1206.
4. Hirai H, Kondo K-I (1991) Modified phases of diamond formed under shock compression and rapid quenching. *Science* 253:773–774.
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Table S2. Similarities between graphene with the proposed *p*-diamond structure

Graphene				"*p* diamond"		
Indices	Calculated, Å	Presolar, Å*	Younger–Dryas, Å* (1)	Indices	Reported, Å (2)	Reported, Å (3, 4)
100	2.130	2.033 (6)	2.076 (4)	111	2.08	2.08
110	1.230	1.230 (2)	1.222 (2)	221	1.20	1.21
200	1.065	1.069 (3)	1.061 (2)	222	1.04	1.05
120	0.805	0.807 (2)	0.798 (1)	412	0.79	0.791
300	0.710	0.709 (2)	0.705 (1)	413	0.70	0.703
				333	0.69	0.672
220	0.615	0.616 (1)	0.609 (1)	334	0.62	
130	0.591	0.593 (1)	0.584 (1)	703	0.59	
400	0.533	0.534 (1)	0.525 (1)			
230	0.489	0.489 (1)	0.479 (1)			
140	0.465	0.465 (1)	0.455 (1)			
500	0.426	0.427 (1)	0.418 (1)			
330	0.410	0.410 (1)	0.397 (1)			

*Detonation synthesized nanodiamonds were used to calibrate diffraction camera length of microscope. Values in parenthesis are the measurement error (in the least significant digit) based on standard error of replicate measurements and the error in camera length calibration (±0.2%).

1. Hexagonal edge length varies slightly from grain to grain.
2. Kleiman J, et al. (1984) Shock compression and flash heating of graphite/metal mixtures at temperatures up to 3200 K and pressures up to 25 GPa. *J Appl Phys* 56:1440–1454.
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4. Yamada K, Tanabe Y, Sawaoka, AB (2000) Allotropes of carbon shock synthesized at pressures up to 15 GPa. *Philos Mag A* 80:1811–1828.