We present experimental evidence of the evolving changes in carbon soot during mechanical milling. The milled soot shows transformations as a function of the milling severity. Those transformations are responsible for the phase change from amorphous carbon to graphenes, followed by graphitic carbon, and highly ordered structures such as morphed graphenes. The morphed graphenes are corrugated layers with cross-linked covalently nature and sp² or sp³ type allotropes. Here is important to mention that this may be the first carbon structure having sp³ bonding that is not diamond. In fact, we believe that this is an intermediate state from graphene to diamond. Electron microscopy (and the TEAM 05 included) is the best tool to clearly identify those phases due to its outstanding resolution and damage prevention. Other characterization techniques such as XRD, Raman and XPS fade to convey a true identification of those phases because the samples are usually blends or mixes of the investigated phases.

**Keywords:** Mechanical milling, soot, morphen graphenes

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