



A much too modest proposal

My wife Connie had the great misfortune of dating me while I was a graduate student in materials science in my mid-30s. Having entered the field with a chemistry background, I was just discovering the joys of phase diagrams at about the time our relationship began looking as if it would be stable, in stark contrast to all the metastable, outright unstable, or downright immiscible relationships that had littered my past.

Any male carbon-based life form in this position knows that the female carbon-based life form he has fallen in love with requires the presentation of a carbon trinket with the appropriate cut, color, clarity, and carats as part of the deal to guarantee continued phase stability. (One wonders whether, if there is silicon-based life somewhere in the universe, as has been suggested, the same relationship obtains; that is, does the female silicon-based life form require the presentation of a sample of silicon—say, in the form of a computer chip—as a precursor to marriage? If so, would a CPU be more coveted than a memory chip?)

Trying to avoid the whole scenario entirely, I initially offered Connie what I thought was an excellent compromise: instead of a diamond the size of a pea—and a baby pea at that—I generously suggested that I buy her a cubic zirconia crystal bigger than her head. This, I thought, would allow her to triumph over her friends, as she waved the roughly-bowling-ball-sized shiny object in their faces, putting to shame the comparatively nanosized diamonds they sported on their fingers. This suggestion was greeted with some unrepeatable verbiage from my beloved, whose general gist can be summarized for this publication as “no.”

The budding materials scientist in me naturally turned to the carbon phase diagram for guidance. A few minutes of study gave me the ammunition I was looking for: at room temperature and pressure, the stable form of carbon is graphite! Diamonds are metastable under these conditions, and entropic thermodynamic forces would be trying with all their might to turn diamonds into graphite, though kinetics suggests that the process might take millions of years. Kinetics be damned, I thought! Our love was true enough to last an eternity, and I would not spend that interval anxiously awaiting the slow phase changes of a diamond engagement ring into graphite under the unyielding forces of entropy. Surely anyone would agree that it was best to go with phase stability from the start.

Thus the idea for a graphite engagement ring was born. But after the cubic zirconia debacle, how to sell the idea to Connie in a manner that would yield a positive response? After some thought, it occurred to me that a two-pronged approach was best.

Thus it was that, waiting for the appropriate mood and moment, I broached the subject again with my (I hoped) wife-to-be.

Imagine this, I said: As the sun slowly sets over the ocean, I kneel down on one knee in the sand and, with loving heart and hands, present you with not one but two packages. The first would contain a graphite ring—admittedly not shiny, but then again what is this fascination with shiny objects about anyhow?—and the second a piece of paper containing a lovingly hand-drawn carbon phase diagram. Think of it, I said, never having to search for a pencil again, being ready at all times with your graphite ring to sign for a package or solve a crossword puzzle. Sure, diamonds can scratch glass, but how many times in your life have you needed to do that? And when your girlfriends ask about the charcoal on your ring finger, you can pull out the carbon phase diagram and explain to them that their paltry diamonds are destined for dust, given thermodynamics, kinetics, and eons of time. To make things even more convenient, the phase diagram would be wallet-sized and laminated.

I know what you are thinking: surely science and logic triumphed over tradition and sentimentality, and she fell into my arms, clutching the cherished, plastic-encased phase diagram to her overflowing heart.

But you would be wrong. As logical and practical as Connie always was, she insisted on the traditional metastable diamond ring as proof of my love. And she got it.

Almost 15 years into a happy marriage, I realize that I was born too soon. The discovery in recent years of graphene, the single layer of carbon atoms that is stronger than steel, has amazing electrical and optical properties, and has the capability of revolutionizing nanoscience, would surely have tipped the equation in my favor. If I were a young man in love now, I would propose to my beloved with a graphene ring, at a cost of \$250 per square foot, only a fraction of what I paid for the pea-sized diamond. Though it couldn't be seen with the naked eye—as a graphite ring could (I'm just sayin')—there would be a second package to go along with what looked like an empty gold ring setting—an atomic force micrograph of her invisible graphene proof of love. Surely the micrograph in place of the hand-drawn carbon phase diagram would make all the difference. Right? Did I mention it would be wallet-sized and laminated?

I leave it up to some other intrepid young man who is running out of options—I mean, who has fallen in love and wants to get married—to provide empirical verification of this thought experiment. If it works, I'm happy to split the difference in cost between the diamond and graphene ring. If it fails, don't blame me—it obviously wasn't meant to be. True love transcends carbon phases, as my mother always said.

Tim Palucka