19ª PROCESSO DE SELEÇÃO DE CANDIDATOS AO CURSO DE MESTRADO EM QUÍMICA
PROGRAMA DE PÓS-GRADUAÇÃO EM QUÍMICA
UNIVERSIDADE FEDERAL DE OURO PRETO

CHAVES DE RESPOSTA
AVALIAÇÃO DE CONHECIMENTOS EM LÍNGUA INGLESA

Leia o texto para responder as questões que seguem:

"Ultra-uniform nanodiamonds – which have important applications in areas like drug delivery, sensors and quantum computer processors – have been made without resorting to explosions […]. The traditional way of growing nanodiamonds is by detonating an explosive like TNT in a sealed stainless-steel container. The blast turns the carbon in the explosive material into tiny diamond particles. However, this detonation is crude and difficult to control, and it produces diamonds of uneven size. 'This an extremely violent and uncontrolled process, and it also means that a lot of the things that we don't want in a diamond that are present in the explosives end up in the diamond,' explained Hao Yan, the project's principal investigator at the University of North Texas in the US. 'So, you have a lot of uncontrolled defects and impurities, and you end up more with a pile of soot than the diamond that you imagined. From a chemist's perspective, we would like to develop a method that is a lot more controllable.'

Yan and his team realized that diamonds are formed in the Earth's mantle where there's a lot of iron–carbon compounds, including carbides and carbonates, and that diamonds grow when iron carbide reacts with iron oxide. Therefore, they designed a chemical process to mimic the environment found beneath Earth's surface. The researchers created uniform iron carbide nanoparticles and then dotted them throughout an iron oxide matrix. They then placed this in a high pressure and high temperature environment. The compounds reacted to create very uniform nanodiamonds, which were 2 nm wide with differences of less than 1 nm between them. […]

The work Yan's team has done is on the lab scale, but he says the conditions that would be used to make these nanodiamonds are similar to those used by the gemstone industry. The only difference is the precursor that is used. 'So, to scale this reaction up, all the infrastructure is really already there,' Yan said. His team is already in contact with researchers and industrial partners to try to prove that the method they have developed can be scaled up to produce gram and even kilogram quantities of uniform, high quality nanodiamonds.

'This is a great idea to use metal carbides to synthesize nanodiamond materials at natural, equilibrium conditions,' says Peter Pauzauskie, a professor of materials science and engineering at the University of Washington in the US who was not involved in this research. […] Pauzauskie also notes that he cannot yet conclude from the transmission electron microscopy images that the authors have indeed made diamond. […] 'I've seen several papers published claiming to have synthesized nanodiamond, when in fact the authors have made metallic nanocrystals (copper, iron, etc) and not nanodiamond'."

Fonte:
https://www.chemistryworld.com/news/making-high-quality-uniform-nanodiamonds-without-the-explosions/4015428.article (acesso em 28/12/2022)

1. **This passage is mostly about:**

   (a) the use of TNT to growing nanodiamonds

   (b) the several applications of nanodiamonds

   (c) the formation of natural diamonds in the Earth's mantle

   (d) a new method to synthesize nanodiamonds

2. **According to the text, the following factors make the use of explosives for growing nanodiamonds disadvantageous, except:**

   (a) it is more expensive than obtaining diamonds from natural sources

   (b) it generates uncontrolled defects and impurities in the nanodiamonds

   (c) it produces diamonds of uneven size

   (d) it is difficult to control

3. **According to the text, the conditions used in the new method to synthesize nanodiamonds simulate:**

   (a) the conditions found in the Earth's mantle

   (b) the conditions obtained by detonating an explosive

   (c) the conditions of a sealed stainless-steel container

   (d) the conditions of the atmosphere

4. **Read the following sentence: "The traditional way of growing nanodiamonds is by detonating an explosive like TNT in a sealed stainless-steel container".**

   The word "traditional" can be replaced with, except:

   (a) habitual

   (b) conventional

   (c) unusual

(d) common

5. **Read the following sentence "The researchers created uniform iron carbide nanoparticles and then dotted them throughout an iron oxide matrix"**

   The word "throughout" has the following meaning:

   (a) on the side of

   (b) on the edges of

   (c) in a specific point of

   (d) in every part of

6. **In the sentence "…this detonation is crude and difficult to control, and it produces diamonds of uneven size", in the first paragraph, the word "it" refers to:**

   (a) control

   (b) detonation

   (c) diamonds

   (d) crude

7. **According to the text, the following conditions or compounds are needed to produce nanodiamonds without resorting to explosions, except:**

   (a) high pressure and high temperature

   (b) iron carbide nanoparticles

   (c) trinitrotoluene

   (d) iron oxide

8. **According to the text, it is correct, except:**

   (a) The conditions to make nanodiamonds in large scale using the new method are similar to those used by the gemstone industry

   (b) The evidence that nanodiamonds were produced under controlled conditions was not questioned for anyone

   (c) It is possible to scale up the new method of nanodiamonds production

(d) The new method of nanodiamonds production is on the lab scale