**Decaffeination**

Early decaffeination attempts involved soaking the green beans in water and then using various solvents to separate out the caffeine in the resulting water solution. The beans were then re-introduced to the caffeine-free solution in order to absorb some of the flavor they had lost. Solvents used included benzene, chloroform, and trichloroethylene, all of which were later found to have toxic effects. In the 1970s, dichloromethane came into use to replace the earlier solvents before it too was deemed possibly carcinogenic

In response to these concerns about solvents, some coffee companies began to run the water solution through charcoal filters as a means of removing the caffeine. The so-called Swiss Water Process, developed in Switzerland in the 1930s, goes one step further. After a batch of coffee beans has been steeped in hot water, that water is filtered (the resulting solution is referred to as “flavor-charged”), and then is used to soak the next batch of beans to be processed. In this way, the beans lose caffeine as they soak, but lose less of their flavor.

Yet another method that aims to safely remove caffeine from coffee beans involves a fascinating chemical process. The solvent used in this method is neither water nor one of the earlier toxic solvents. Instead, caffeine in the coffee beans is dissolved by means of carbon dioxide. In order to accomplish this, the carbon dioxide must become a supercritical fluid, created when it is compressed and heated to the point that it has the same density in liquid and gaseous forms. As this supercritical CO2 is passed through the beans, it can penetrate them because of its gaseous properties, and yet is able to dissolve the caffeine they contain because of its liquid properties.

1. Coffee is mixed with pure water - **SOAKING** green coffee beans in water doubles their size, allowing the caffeine to dissolve into water inside the bean.
2. **CAFFEINE REMOVAL** occurs in an extraction vessel, which may be 70 feet high and 10 feet in diameter,suffused with carbon dioxide at roughly 200 degrees Fahrenheit and 250 atmospheres. Caffeine diffuses into this supercritical carbon dioxide, along with some water. Beans enter at the top of the chamber and move toward the bottom over five hours. To extract the caffeine continuously, the beans lower in the column are exposed to fresher carbon dioxide, which ensures that the caffeine concentration inside beans is always higher than in the surrounding solvent. Caffeine therefore always diffuses out of the beans. Decaffeinated beans at the bottom of the vessel are removed, dried and roasted.
3. **RECOVERY** of dissolved caffeine occurs in an absorption chamber. A shower of water droplets leaches thecaffeine out of the supercritical carbon dioxide. The caffeine in this aqueous extract is then often sold to soft-drink manufacturers and drug companies. The purified carbon dioxide is recirculated for further use.

**Vocabulary:**

absorb- absorbować

accomplish – osiągnąć, zrealizować

aqueous extract – wodny wyciąg

attempt - próba

batch – partia

carbon dioxide – dwutlenek węgla carcinogenic – rakotwórczy chamber – komora

charcoal filters – filtry węglowe coffee bean – ziarno kawy continously – ciągle, bez przerw decaffeination – dekofeinizacja deem – uznać, uważać

density – gęstość

diameter - średnica

diffuse – dyfundować

dissolve – rozpuszczać

droplets – kropelki

ensure- gwarantować, zapewniać

fascinating process – fascynujący proces

filtered – przefiltrowany

flavor-charged – pełen smaku

gaseous form – forma, postać gazowa

leach – płukać, ługować

method – metoda

penetrate - penetrować

processed – przetwarzany

removing - usuwanie

roughly – z grubsza

separate – oddzielać

soak – moczyć, nasiąkać

steep – namaczac

suffused - przesycony

supercritical fluid – nadkrytyczny płyn

toxic effects – toksyczne efekty

toxic solvents – toksyczne rozpuszczalniki

**Exercise 1. Name three steps of modern decaffeination process, then put them in the correct order:**

|  |  |
| --- | --- |
| ……………………. | Caffeine removal occurs in an extraction vessel. Caffeine diffuses into this supercritical carbon dioxide, along with some water. Beans enter at the top of the chamber and move toward the bottom over five hours. To extract the caffeine continuously, the beans lower in the column are exposed to fresher carbon dioxide, which ensures that the caffeine concentration inside beans is always higher than in the surrounding solvent. Caffeine therefore always diffuses out of the beans. |
| …………………….. | A shower of water droplets leaches the caffeine out of the supercritical carbon dioxide. The caffeine in this aqueous extract is then often sold to soft-drink manufacturers and drug companies. |
| …………..…………. | green coffee beans in water double their size, allowing the caffeine to dissolve into water inside the bean. |

**Exercise 2. Complete the following sentences:**

1. Early decaffeination ........... . involved soaking the green beans in water and then using various solvents to separate out the caffeine in the resulting water solution.
2. In the 1970s, dichloromethane came into use to replace the earlier solvents before it too was ............ possibly carcinogenic.
3. (...) some coffee companies began to run the water solution through ........... ........... as a means of removing the caffeine.
4. Yet another method that aims to safely remove caffeine from coffee beans involves a ........... chemical ........... .
5. Supercritical CO2 is created when it is compressed and heated to the point that it has the same .......... in liquid and .......... forms.

**Exercise 3. Search ten more words from the text. → ← ↓ ↑ ; give their Polish equivalents.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| M | C | P | C | F | L | S | W | S | D | F | S | Y | P | K |
| S | H | J | H | T | Z | W | R | U | E | S | U | X | E | H |
| R | W | O | A | P | O | S | D | P | C | T | O | F | W | C |
| O | N | K | V | O | K | O | L | E | A | E | E | W | W | T |
| X | E | Q | S | H | C | A | P | R | F | L | U | D | T | A |
| M | N | U | M | I |  | L |  | K | R | C | F | P | Q | M | V | B |
| V | S | D | A | G | A |  | C | O |  | R |  | E |  | O | A | A | Y | B |
| F | U | Y | L | I | O |  | E | J | I | I | R | C | B | V | G |
| G | R | S | D | E | C |  | K | Q | T | N | D | P | I | P | L |
| D | E | V | R | B | R | Q | F | I | A | Z | X | W | T | C |
| R | H | L | T | V | A | Y | M | C | T | H | C | W | N | N |
| J | I | A | X | A | H | L | K | A | I | J | X | B | A | Z |
| G | D | F | V | V | C | L | H | L | O | S | M | D | E | J |
| B | B | Q | S | L | F | N | U | R | N | O | I | H | B | X |
| O | D | I | F | F | U | S | E | M | I | P | J | R | R | P |

**Exercise 4. Translate into English: (Passive)**

1. Zielone ziarna kawy są namaczane w czystej wodzie.

……………………………………………………………………………………………………………………………………………………………

1. Kofeina jest wypłukiwana z nadkrytycznego dwutlenku węgla przez wodę.

……………………………………………………………………………………………………………………………………………………………

1. Rozpuszczalniki, takie jak benzen były używane w latach 70.

……………………………………………………………………………………………………………………………………………………………

1. Kofeina była usuwana z ziaren za pomocą filtrów węglowych.

……………………………………………………………………………………………………………………………………………………………

1. Wodny ekstrakt kofeiny jest sprzedawany do firm farmaceutycznych.

……………………………………………………………………………………………………………………………………………………………

**Exercise 5. Complete the sentences: (purpose)**

1. Next the beans were re-introduced to the caffeine-free solution …………………… (aby wchłonąć) some of the flavor they had lost.
2. …………………………………………………. (żeby to osiagnąć), carbon dioxide must become a supercritical fluid.
3. Various solvents were used …………………..……….. (aby oddzielić) caffeine in the resulting water solution.
4. ………………………….. ( w celu ekstrakcji) the caffeine continuously, the beans lower in the column are exposed to fresher carbon dioxide