

Student Worksheets

Extension Unit

of the starter course module

Reading Academic Texts in English

Developing Critical Reading Competences

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Starter course

Entwickelt an der Universität Siegen im Rahmen des Projekts „Mehrsprachigkeit und Multikulturalität im Studium (MuMiS)“,

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Weitere Informationen über das MuMiS-Projekt und weitere Materialien finden Sie unter:

<http://www.mumis-projekt.de/>



Activity 1: Fact or opinion?

🕒 2 min

Together with a partner, decide whether the following statements are facts or opinions. The first one has already been done for you.

1. The apple is the fruit of the apple tree, species *Malus domestica*. Fact
2. The country's investment stands at 2% GDP. _____
3. Goethe's "Faust" is beautifully written. _____
4. In fact, the presentation was boring. _____
5. Qualitative studies on the art market reveal the differences between prices in art galleries and the prices at auctions. _____
6. The press coverage of the Fukushima disaster was a disgrace. _____



Activity 2: Hedges and boosters

🕒 4 min

Fill in the gaps. Use only hedges for the first text and only boosters for the second text. Then compare the meanings the texts convey and mark the continuums for each text with a cross.

Hedges:

are likely to, can, may, rather, seems like, speculated, ~~suggest~~, suggests

might keep

An apple a day ~~keeps~~ the doctor away

New studies *suggest* that eating one apple per day _____ keep you healthy. It _____ the other fruits cannot compete with apples.

Research _____ that apples _____ reduce the risk of cancer and _____ prevent heart disease.

It is _____ that sports and vegetables are _____ irrelevant to healthy living.

← probably healthy definitely healthy →

Worksheets

Boosters:

absolutely, ~~clearly show~~, is a fact that, most certainly, obviously, proves, really does, without any doubt

definitely

An apple a day ~~keeps~~ the doctor away

New studies *clearly show* that eating one apple per day _____ keep you healthy. It _____ the other fruits cannot compete with apples.

Research _____ that apples _____ reduce the risk of cancer and _____ prevent heart disease.

It is _____ that sports and vegetables are _____ irrelevant to healthy living.

← probably healthy definitely healthy →

Activity 3: Degree of certainty



🕒 2 min

Try to put the following expressions in a descending order according to the degree of certainty they indicate.

(4: high degree of certainty – 1: low degree of certainty)

- X is believed to behave in a way that ...
- An analysis of the data clearly shows that ...
- On the basis of the data given, it can be concluded that ...
- Perhaps the reason for this is that ...



Activity 4: Indicators and restriction markers

🕒 8 min

The course will be divided into two groups, A and B. Working on your own, have a look at the excerpt from an academic text and underline all the indicators (members of group A) / all the restriction markers (members of group B) it contains. Then, discuss your results with a member of the other group.

Remember:

- **Indicators** connect the conclusions with the evidence (*therefore, because, since, it follows that, it can be concluded that, ...*)
- **Restriction markers** imply that the results are limited to certain conditions (*in conditions where, in so far as, when X is the case, if ...*)

The Nucleation of Microcellular Thermoplastic Foam With Additives Part II: Experimental Results and Discussion

"[...] Nucleation in homogeneous systems is affected by the saturation pressure of the gas used to produce the bubbles, and by the surface tension and free volume of the polymer which are affected by the presence of soluble secondary components. Nucleation occurs more readily and in greater numbers in homogeneous polymer systems with an increased free volume of the polymer due to the presence of soluble additives. This is because the activation energy is lowered as a result of the increased intermolecular distance due to the presence of the solute.

Nucleation in heterogeneous systems (such as a polymer with an insoluble second component or when the solubility of the additives is exceeded) may occur both heterogeneously at the interface between the polymer and the second phase and homogeneously in the free volume of the single matrix phase.

Please turn page.

The number of bubbles is larger when homogeneous nucleation dominates, since the number of heterogeneous nucleation sites is controlled by the number of occluded second phase particles, which is typically much smaller than the number of homogeneous nucleation sites. The ratio of the two nucleation mechanism rates is determined by the relative reductions in the activation energy barrier to nucleation (Gibbs free energy). If heterogeneous nucleation is energetically favored and if there are a sufficient number of heterogeneous nucleations sites, it will preclude homogeneous nucleation because the former reduces the gas concentration in the matrix. When second phase additives are well bonded to polymers, the nucleation rate will not be increased, because for nucleation to occur, the bonding force must be broken in addition to the required satisfaction of the energy criteria for heterogeneous nucleation.

In the transition regime, both heterogeneous and homogeneous nucleation occur. The presence of heterogeneous nucleation sites does not preclude homogeneous nucleation. Even when heterogeneous nucleation is energetically favored to occur (i.e., when it has a lower activation energy), homogeneous nucleation can still occur in regions of the material that are unaffected by the heterogeneous nucleation sites. Heterogeneous nucleation can affect homogeneous nucleation by reducing the concentration of gas in the polymer surrounding the heterogeneous nucleation sites. This will lower the rate of homogeneous nucleation. The ratio of heterogeneous to homogeneous nucleation will, therefore, be determined by the differences in their energies. [...]

As explained in Part I (I), the drop in the number of bubbles nucleated occurs because the heterogeneous nucleation sites have a much lower activation energy barrier than the homogeneous sites. As a result, they nucleate first, and in so doing, reduce the concentration of gas in the matrix, especially near the heterogeneous nucleation sites, thereby greatly reducing the homogeneous nucleation rate. Since the number of heterogeneous nucleation sites is typically much lower than the number of homogeneous sites, and because heterogeneous nucleation is the predominant mechanism, the number of bubbles nucleated drops. An increase in the concentration of zinc stearate above its solubility limit increases the number of precipitated particles (heterogeneous nucleation sites) and therefore the number of bubbles produced.

An increase in the saturation pressure has different effects on the number of bubbles produced above and below the solubility limit. Below the solubility limit, the number of bubbles nucleated increases. This is due to an increase in the driving force (ΔP), which reduces the activation energy for homogeneous nucleation. The increase in the gas concentration in the polymer also increases the pre-exponential term in the homogeneous nucleation rate expression (Eqs 1 and 2). These combined effects lead to an increase in the homogeneous nucleation rate. Above the solubility limit, gas saturation pressure has a negligible effect on the number of bubbles nucleated. This is due to the fact that the activation energy is sharply reduced by the presence of the zinc stearate heterogeneous nucleation sites. Therefore, further reductions have little effect. As a result, the dominant nucleation mechanism is heterogeneous. Gas saturation pressure has a small effect on the pre-exponential term in Eq 3 because the number of heterogeneous nucleation sites is governed by the concentration of zinc stearate particles and their size. An increase in concentration of gas will affect only the final size of the bubbles, not their number. [...]

The comparison of Figs. 3 and 4 shows that zinc stearate as an additive produces more bubbles than equal weight percentages of stearic acid. This could be due to two possible reasons. The first [reason] is that the metallic zinc end does indeed reduce the activation energy barrier to nucleation. Further tests with other metallic stearates could quantify or refute such a hypothesis. The other explanation is that by virtue of its two stearate ends, zinc stearate greatly increases the free volume of the polymer in its vicinity. Experimentation with metallic stearates with only one stearic group, such as lithium stearate, would settle this issue."

Colton, J. S. & N. P. Suh (1987). "The Nucleation of Microcellular Thermoplastic Foam With Additives: Part II: Experimental Results and Discussion". In: *Polymer Engineering and Science* 27:7, 493-499.