

Chemistry lab connection research and results

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Ms. Grossmann

Which specific topic or technique did you find in the article to be related to the experiment you performed in this lab course Module?

This research focuses on finding natural pH indicators to use for acid-base titration. The research does multiple titration tests on the different indicators and compares the difference of volume to activate the indicators. (Kapilraj et al., *Natural plant extracts as acid-base indicator and determination of their PKA value* 2019)

What research question(s) / objective(s) did the article address?

Due to the harmful disadvantages of synthetic indicators, the research question was to look for cheaper environmentally friendly indicators that can be used in labs. (Kapilraj et al., *Natural plant extracts as acid-base indicator and determination of their PKA value* 2019)

What procedure(s) did they utilize to answer their proposed research question(s)?

What results did they collect and how did they analyze them?

They found three potential indicators and compared them to normal synthetic indicators often used in normal labs. They used 0.1 M Na_2HPO_4 and 0.1 M KH_2PO_4 . They knew the concentration of both compounds so they knew the volume needed to change colors. The results were surprising. The strong acid-strong base titration using natural indicators achieved the range of needed volume difference from 0.04 to 0.1 while the synthetic achieved the needed volume difference from 0.1 to 0.3. The strong acid-weak base titration using natural indicators achieved the needed volume difference of 0.03 to 0.13 while for the synthetic it was from 0.46 to 1.56. They found out that the natural indicators were more accurate. (Kapilraj et al., *Natural plant extracts as acid-base indicator and determination of their PKA value* 2019)

Q4 Did the researchers answer their question(s) or is further investigation needed? This is sometimes referred to as "future studies"? Explain with details.

They found that the natural indicators were perfect to use as indicators. However, they found one drawback, the natural indicators couldn't be stored for a long time, due to fungal growth. (Kapilraj et al., *Natural plant extracts as acid-base indicator and determination of their PKA value* 2019)

- **The results:**

$$M_1V_1=M_2V_2$$

$$0.1 \times 250 = 0.1V_2$$

$$V_2 = 250 \text{ mL}$$

$$\text{Moles} = \text{mass} / \text{Molar mass}$$

$$0.1M = x / 105.98$$

$$x = 0.1 \times 105.98$$

$$\text{mm} = 10.59$$

Add 4 drops of indicator

$$0.1M \times 100 \text{ mL} = M_2 \times 36, m_2 = 36$$

Till it reached dark Yellow

- **Trial**

1) 45 mL

2) 43 mL

3) 47 mL

Trial	HCl Acid volume (mL)	Na ₂ CO ₃ Base volume (mL)	# of indicator drops	HCl Acid concentration (M)	Na ₂ CO ₃ Base concentration (M)
1	45	36	4	0.1	0.125
2	43	36	4	0.1	0.119
3	47	36	4	0.1	0.130

Error: There is a high possibility of error. Sodium carbonate is soluble in water. However, Our "Sodium Carbonate" was crystalizing in water, which doesn't make sense. The

Bibliography

Kapilraj, N.; Keerthanan, S.; Sithambaresan, M. Natural plant extracts as acid-base indicator and determination of their PKA value. <https://www.hindawi.com/journals/jchem/2019/2031342/> (accessed Mar 5, 2022).