Limiting Reagents

• Usually, quantities mixed do not follow the reaction ratio, so one reactant will run out before the others.
• “limiting reagent” vs. “in excess”
• Usually choose limiting reagent based on cost considerations.

\[ \text{Limiting Reagent?} \]

\[ 2 \text{ NO} + \text{O}_2 \rightarrow 2 \text{ NO}_2 \]
Example- Limiting Reagents

• SiCl₄ is used in making computer chips. It is produced by the reaction:

\[ \text{SiO}_2 + 2\text{C} + 2\text{Cl}_2 \rightarrow \text{SiCl}_4 + 2\text{CO} \]

• How much SiCl₄ can be made from 75 g of each of the 3 reactants?

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Reaction Yields

• Most real reactions produce less product than equations would predict.
• Competing reactions, impurities, time, etc.
• Often report “percent yield”

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Percent Yield

\[ \%\text{ yield} = \frac{\text{actual\ yield}}{\text{theoretical\ yield}} \times 100\% \]

• Actual yield: what you really get, from experiment
• Theoretical yield: what you expected, from calculations
• Actual yield < theoretical yield, usually
NO + NO₂ → N₂O₃

A mixture of 10.0 g NO and 14.0 g NO₂ reacts to produce 8.52 g N₂O₃. What was the percentage yield?