# Transesterification Parameter Ranges for Model Training

This document summarizes literature-based parameter ranges for the transesterification of waste cooking oil with methanol into biodiesel. These values are intended to inform and guide kinetic model development.

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| Parameter | Typical Range |
| Triglyceride (TG) Molecular Weight | ≈ 875.0 g/mol |
| Methanol (MeOH) Molecular Weight | ≈ 32.04 g/mol |
| FAME (Biodiesel) Molecular Weight | ≈ 296.0 g/mol |
| Glycerol (Gly) Molecular Weight | ≈ 92.09 g/mol |
| Reaction Temperature | 50–65 °C (Optimum: ~60 °C) |
| Methanol-to-Oil Molar Ratio | 6:1 to 12:1 (Optimum: ~8:1–10:1) |
| Catalyst Concentration | 1–2 wt% (Optimum: ~1.2–1.5 wt%) |
| Reaction Time | 60–120 minutes |
| Mixing Speed | ~600 rpm |
| Activation Energy (Ea) | 57–62 kJ/mol |
| Pre-exponential Factor (A\_f) | 10⁷ to 10¹¹ min⁻¹ |
| INITIAL\_K\_CAT\_GUESS | 1.0 (model units) |
| INITIAL\_KM\_GUESS | 0.1 (model units) |
| Normalization - Temperature (Mean ± Std) | 60 ± 5–10 °C |
| Normalization - Catalyst Concentration (Mean ± Std) | 1.5 ± 0.5 wt% |
| Normalization - Species Concentrations (Example) | [0.5, 0.5, 0.5, 0.1] mol/L for TG, MeOH, FAME, Gly |