

# Hydrodynamic disintegration of sewage sludge – recovery of organic compounds, biomass deactivation, cell lysis

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Monika Zubrowska-Sudol, Justyna Walczak

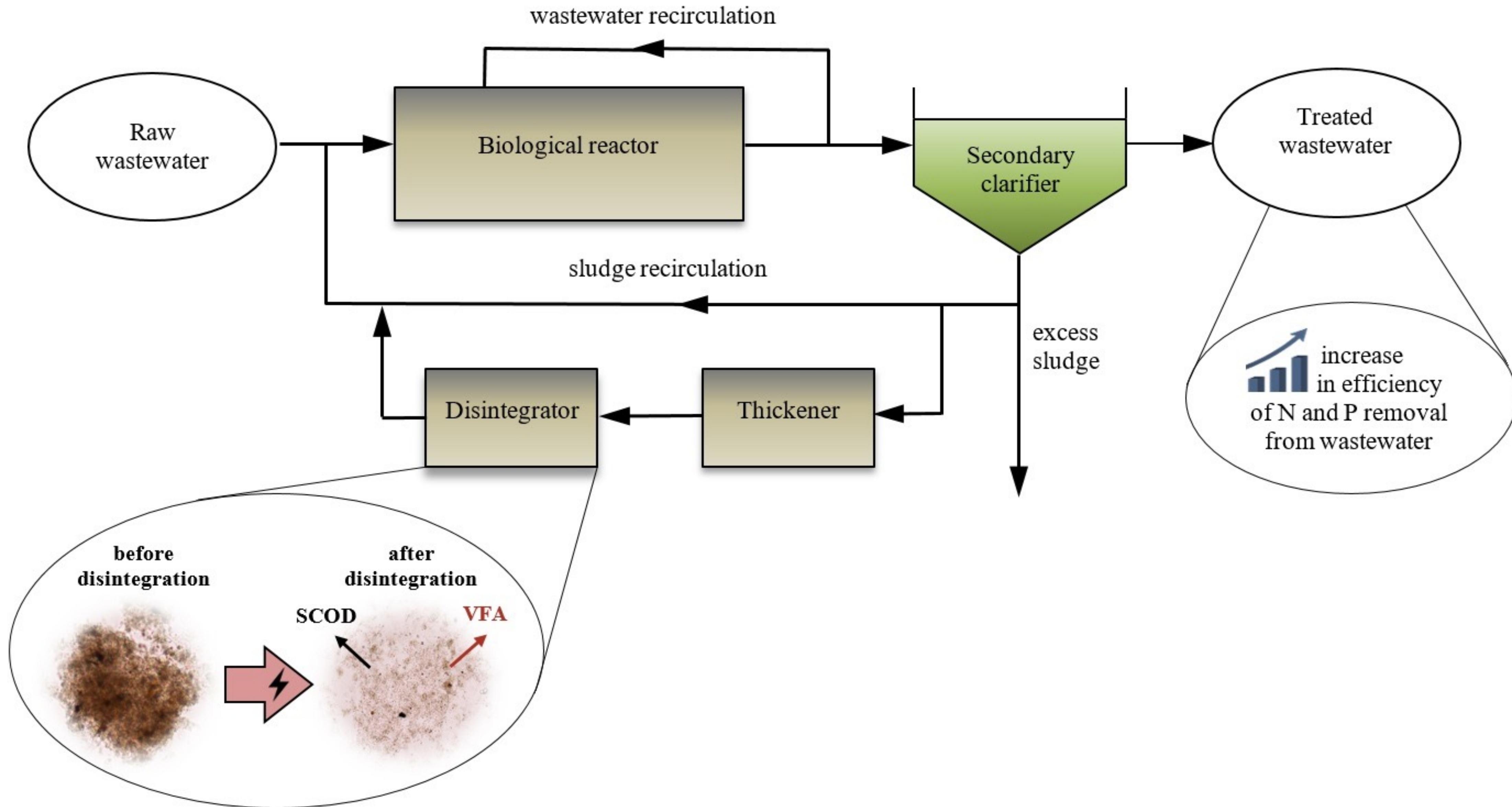
Nina Doskocz, Anna Narożniak

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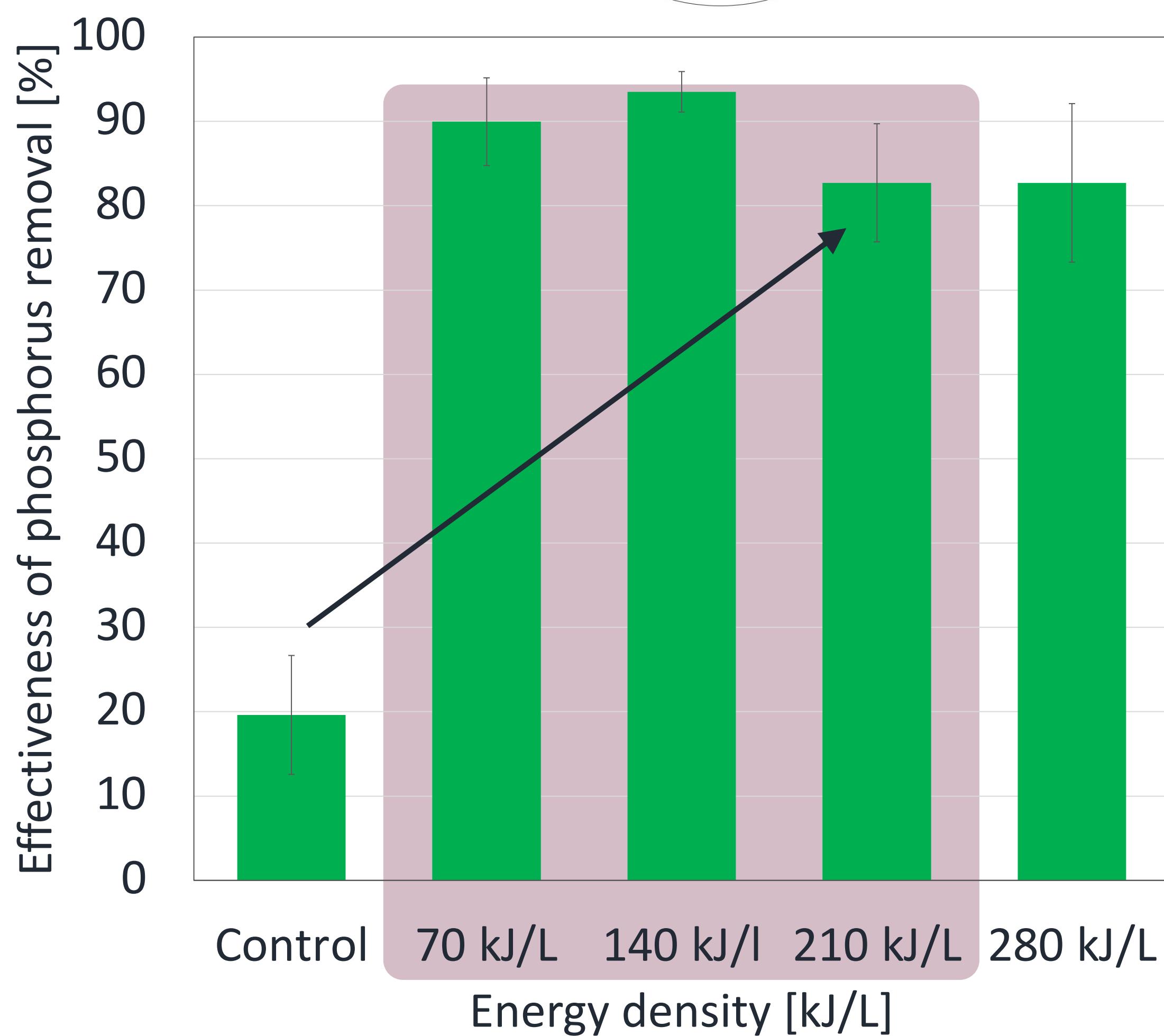
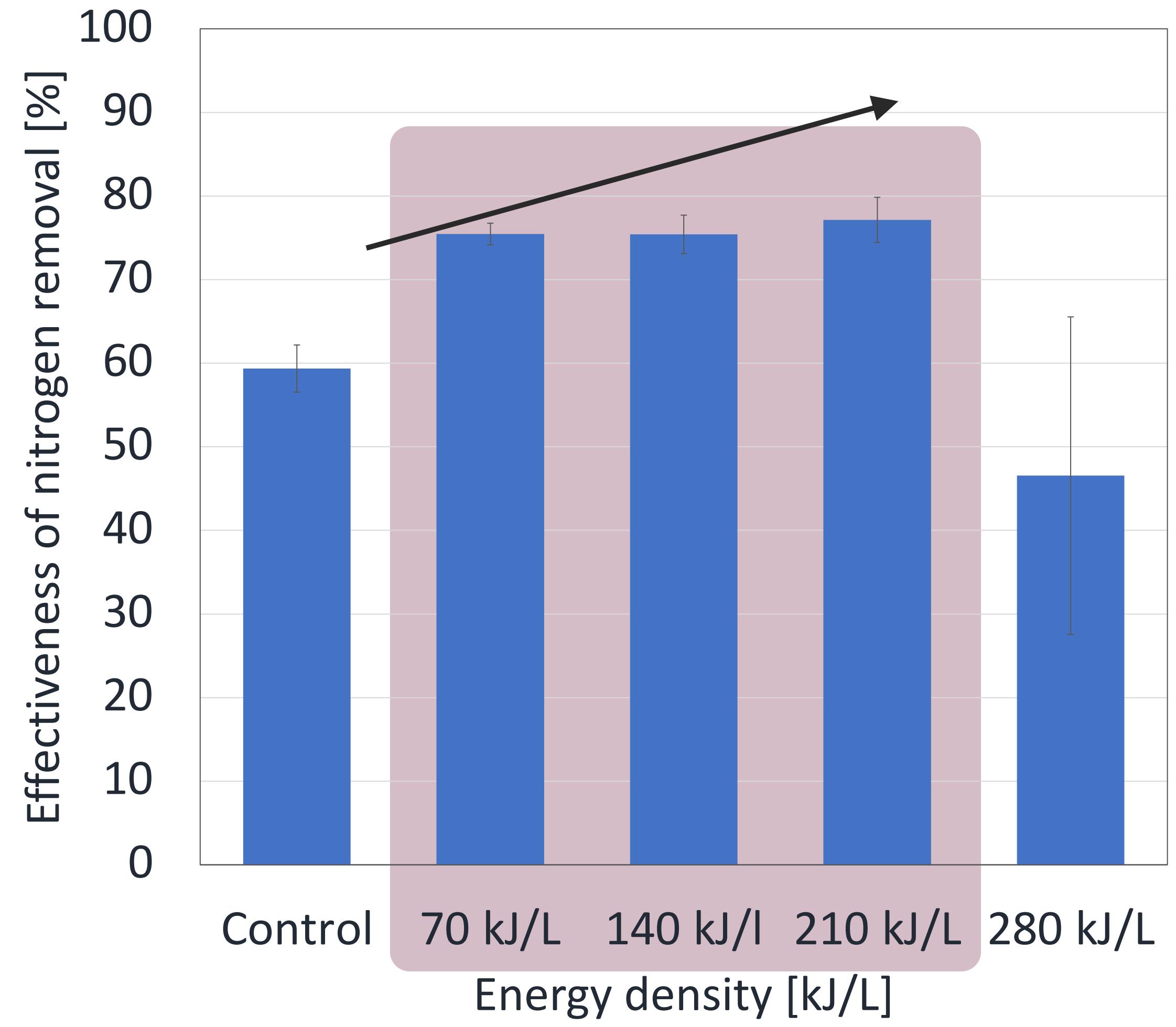
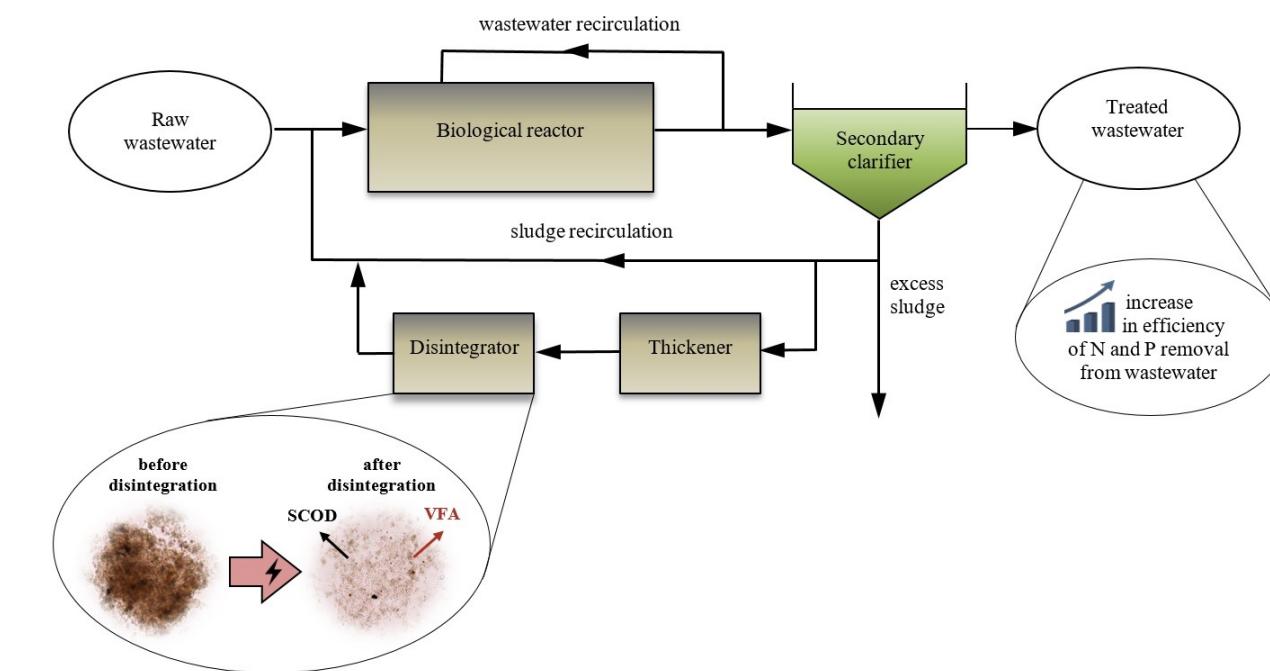
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**Can potential worsening of the quality of treated wastewater  
be predicted based on the analysis of changes in the properties  
of sewage sludge resulting from disintegration in the case of  
use of disintegrated sludge as a source of organic carbon for  
biological nutrient removal?**

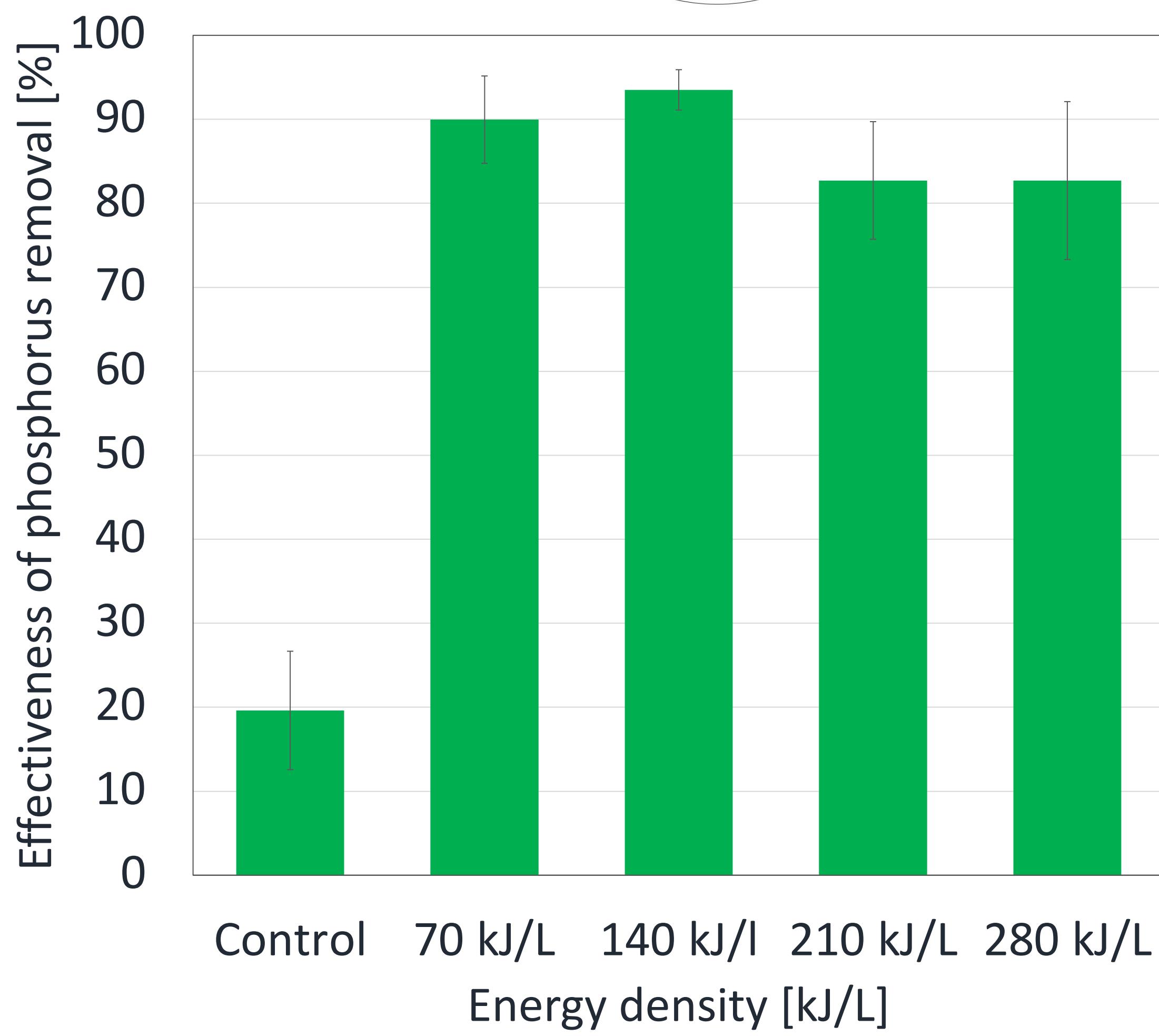
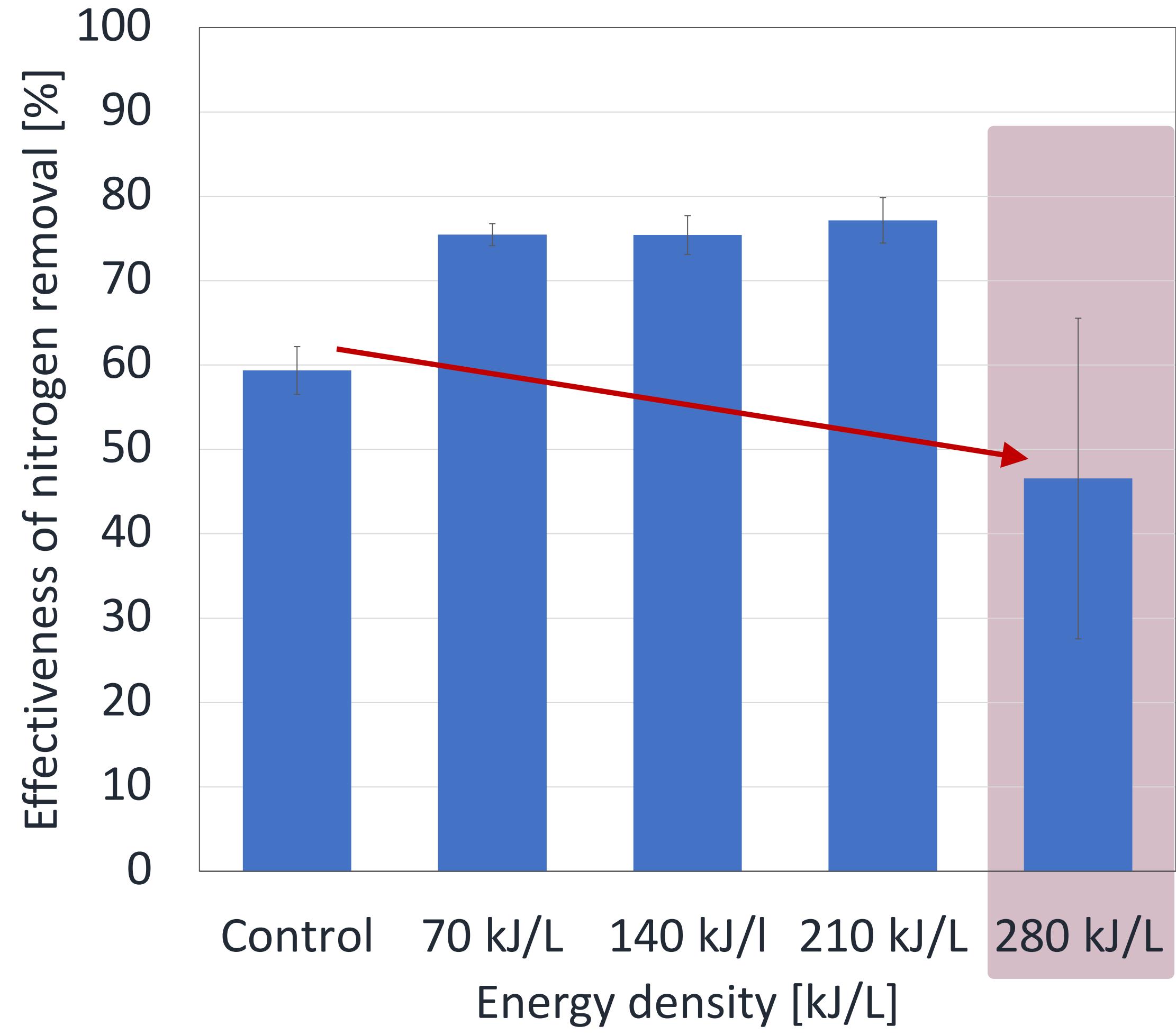
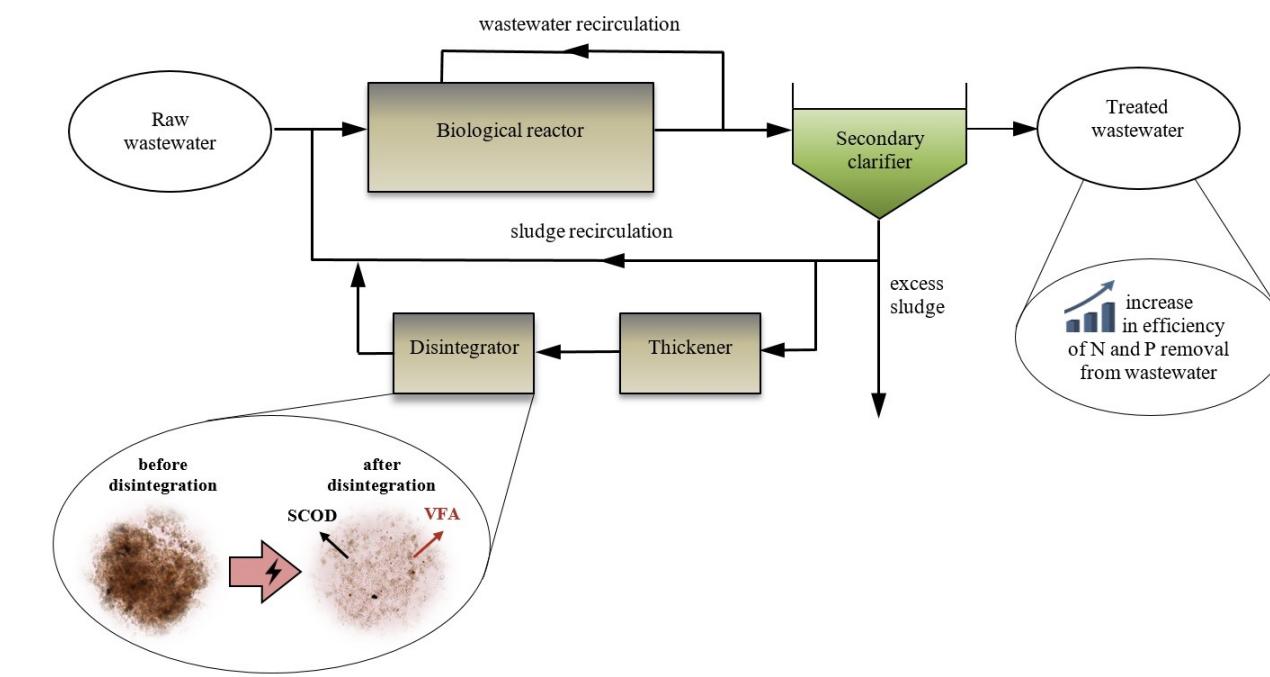
# TOPIC JUSTIFICATION



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# METHODS

## Partial experimental objectives

Recovery of organic compounds  
from activated sludge flocs

Analysis of microorganisms  
deactivation

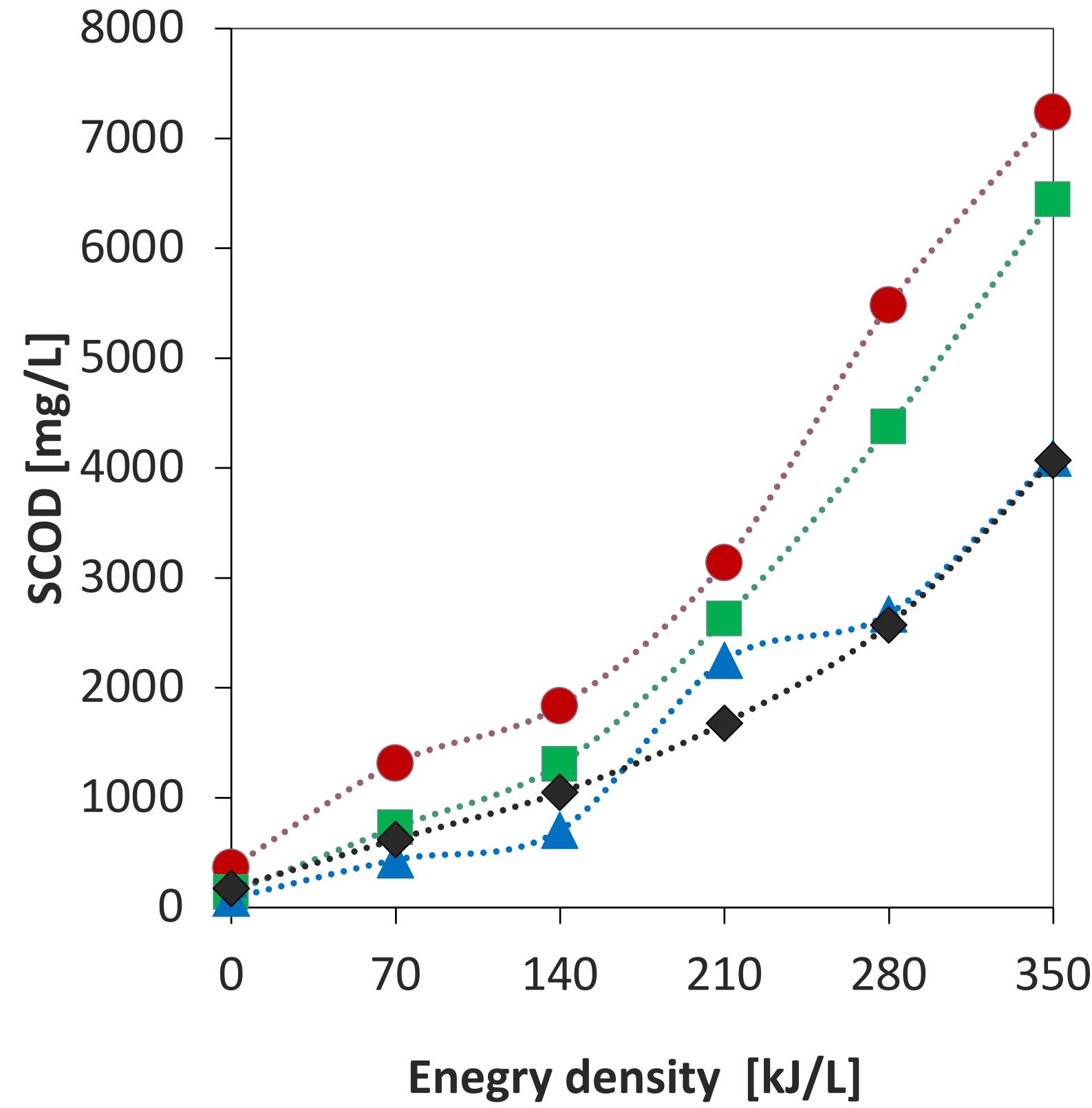
Analysis of cell lysis

# METHODS

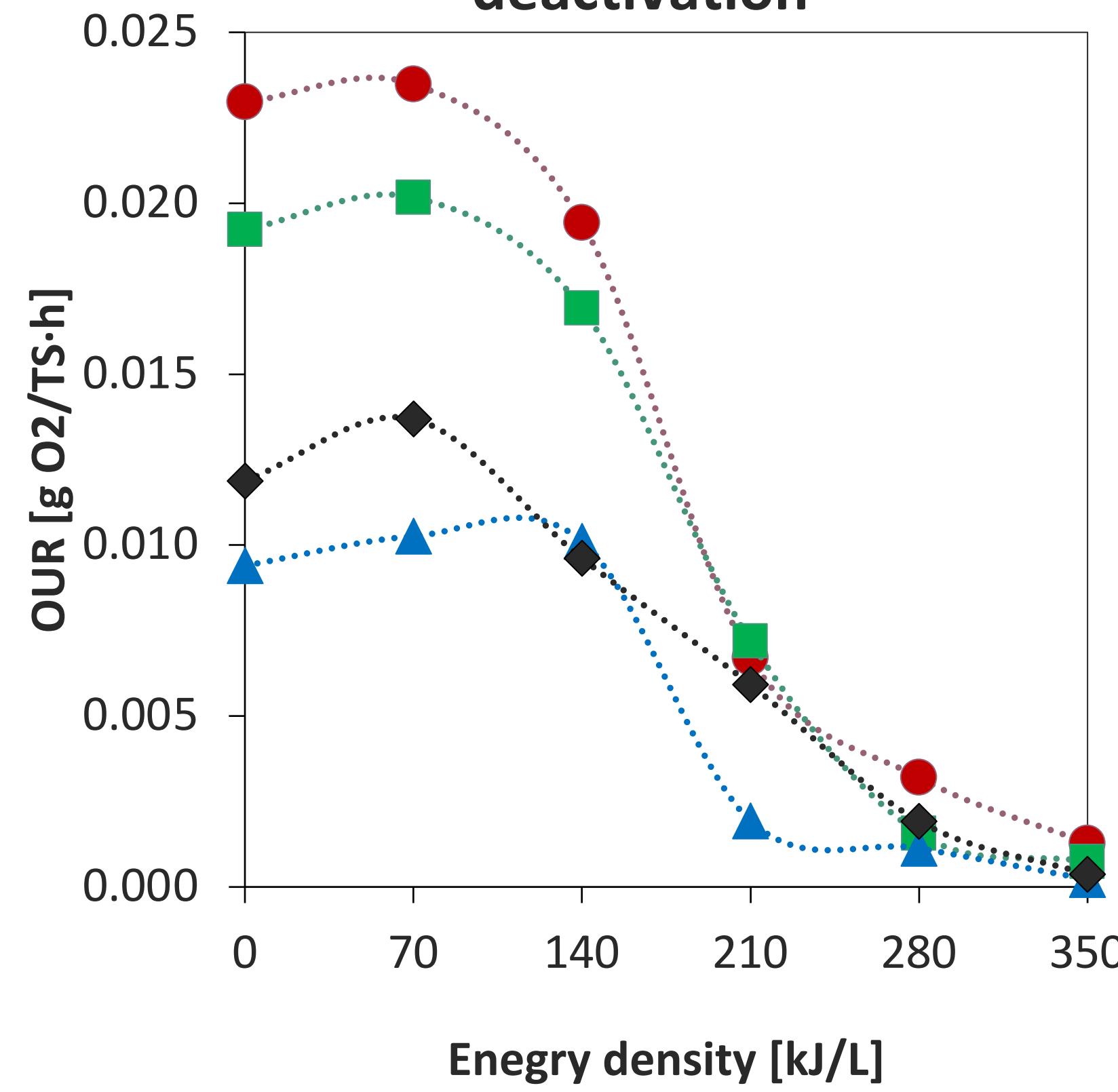
Partial experimental objectives	Their implementation
Recovery of organic compounds from activated sludge flocs	Observations of changes in SCOD concentrations in sludge liquid Determination of the disintegration degree (DD)
Analysis of microorganisms deactivation	Oxygen uptake rate tests (OUR)
Analysis of cell lysis	Observations of changes in DNA concentration in sludge liquid

# RESULTS

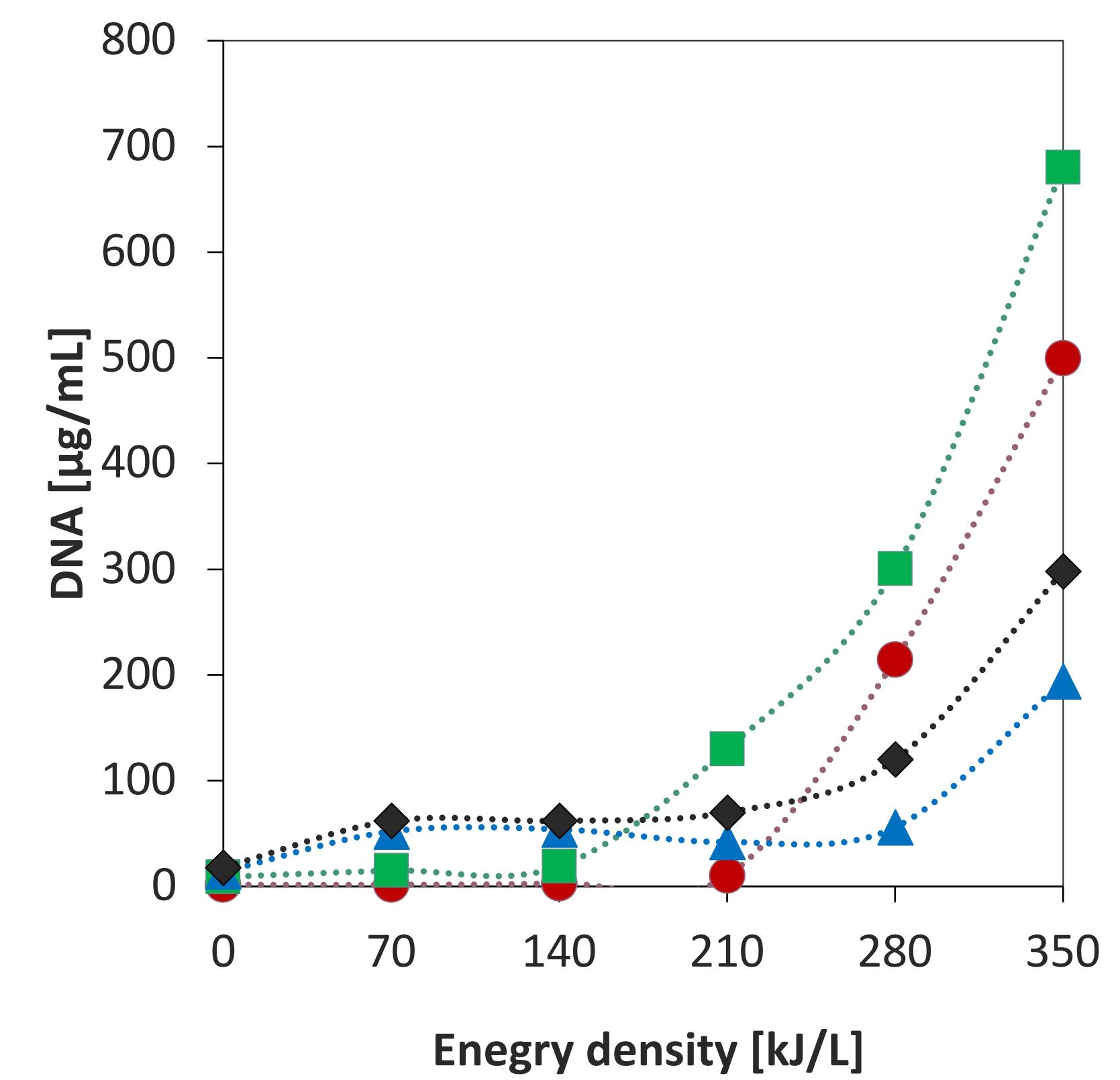
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**Analysis of cell lysis**



● Serie 1

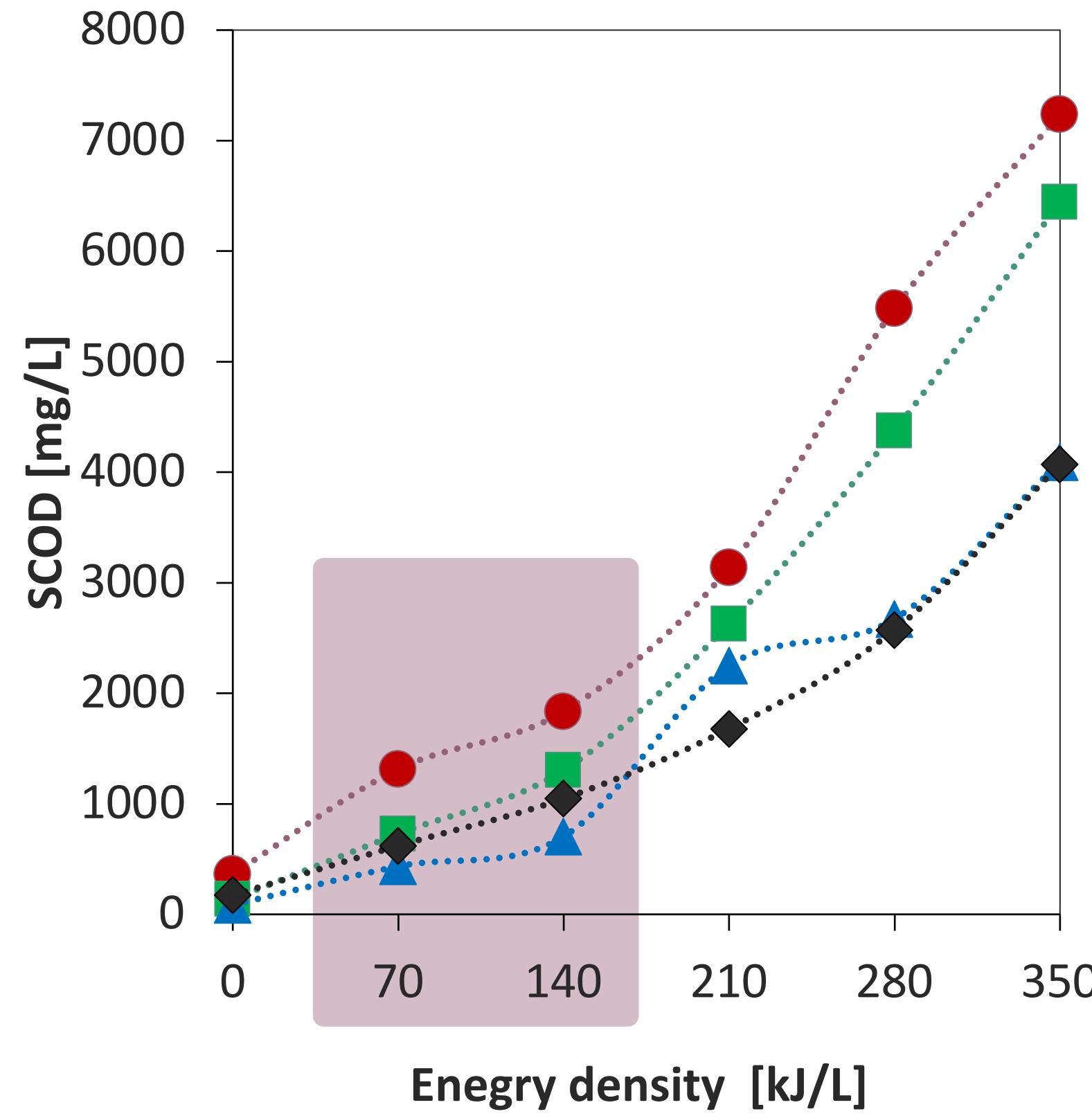
■ Serie 2

▲ Serie 3

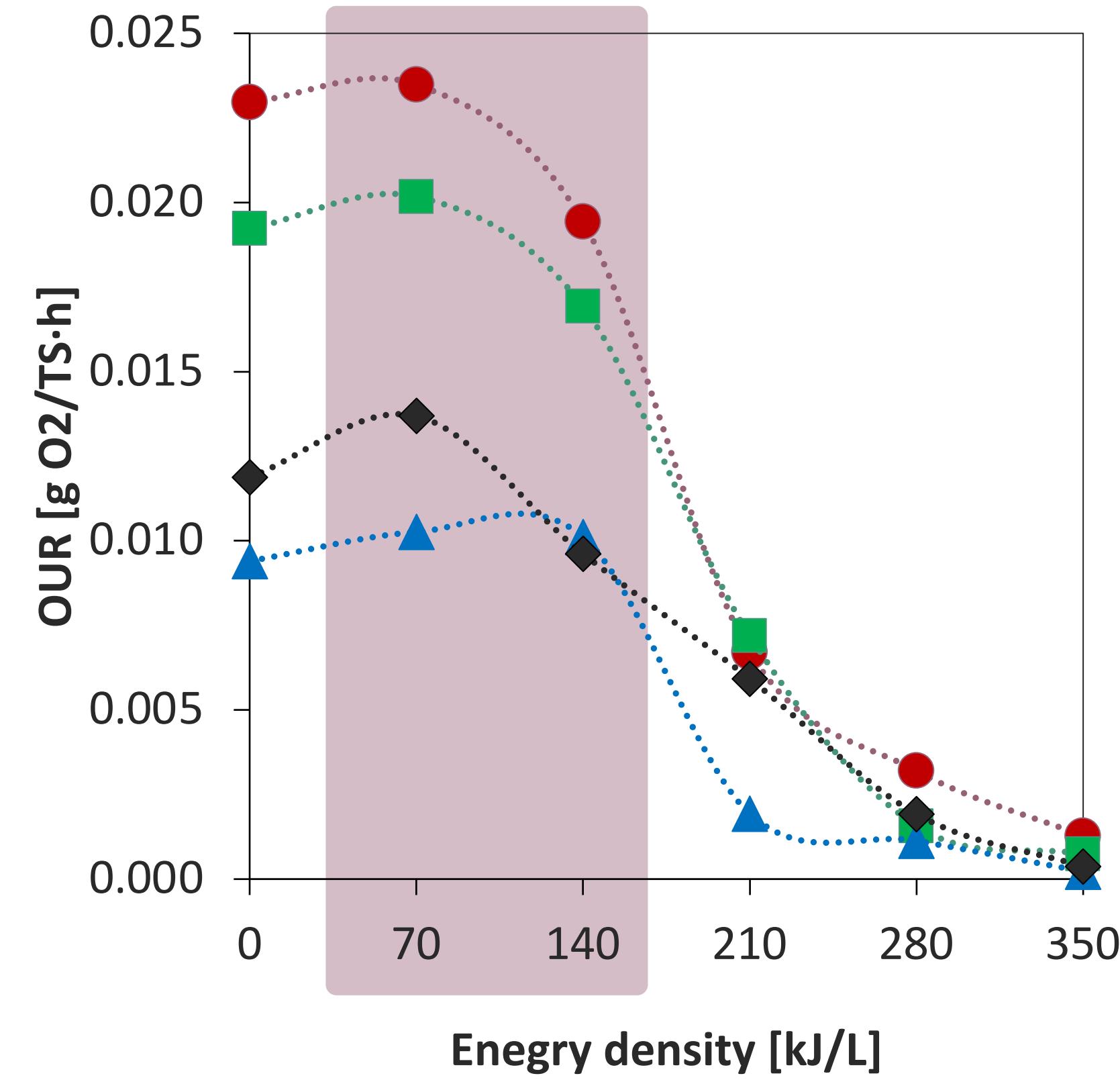
◆ Serie 4

# RESULTS

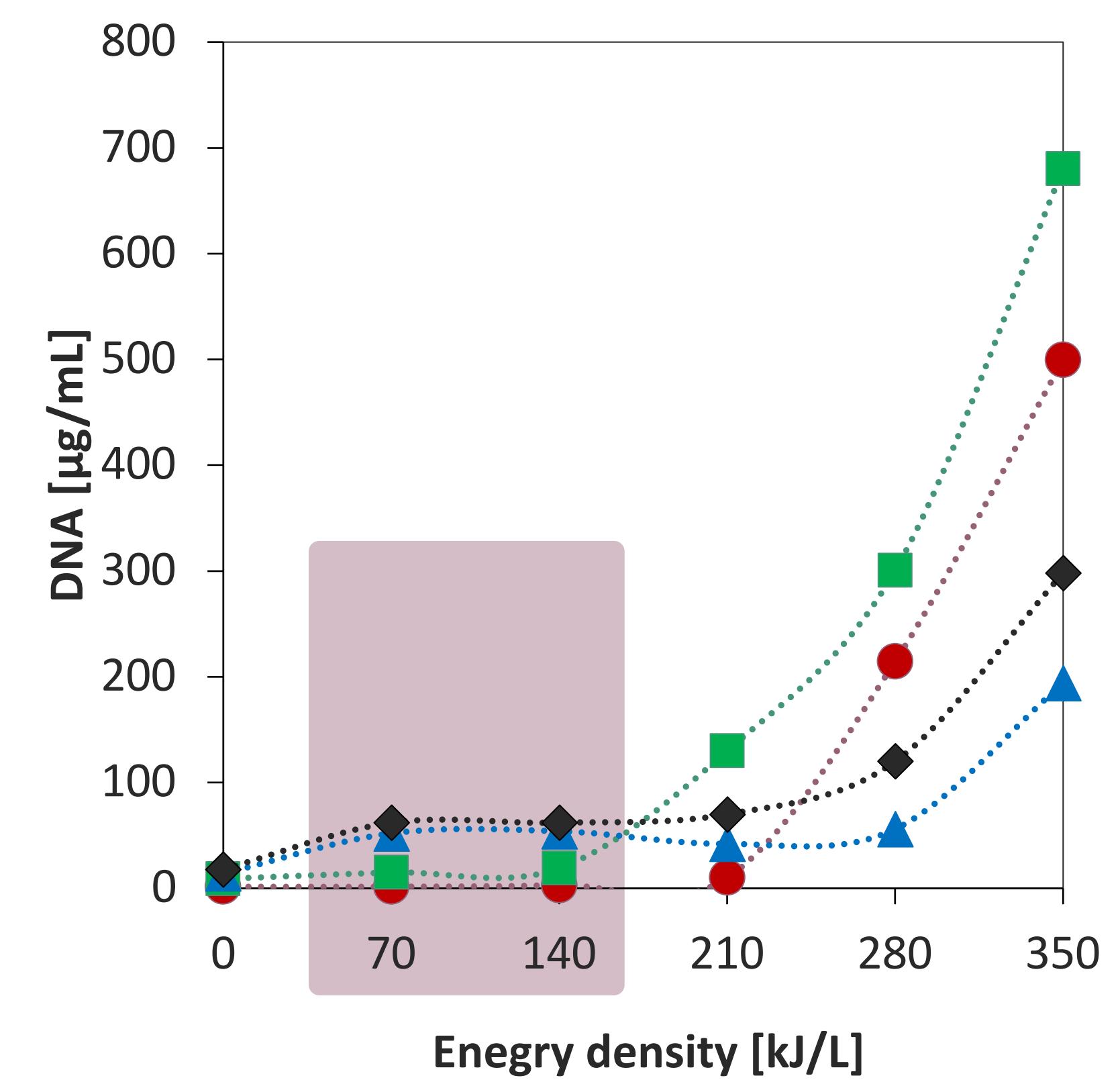
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Analysis of cell lysis



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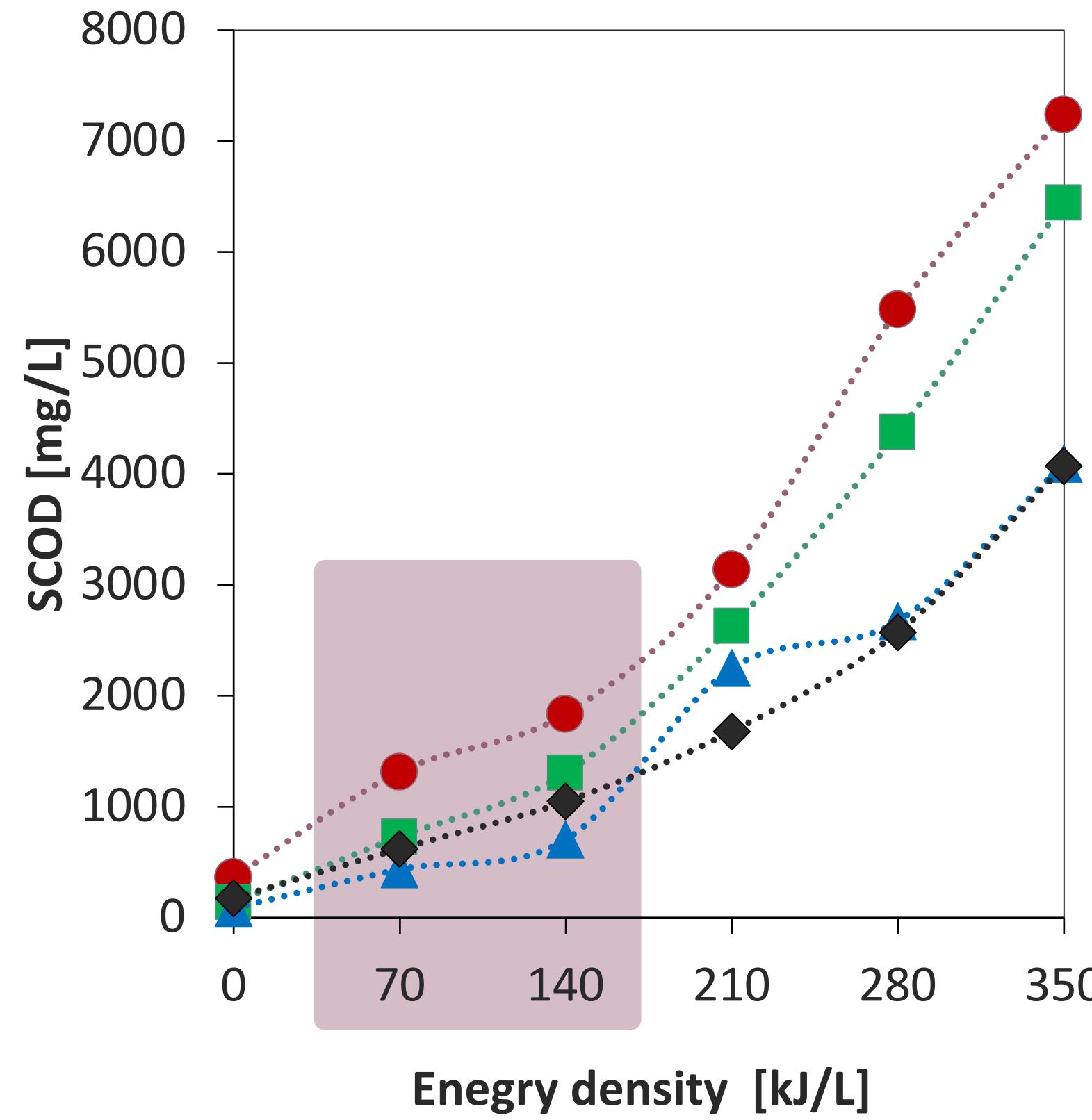
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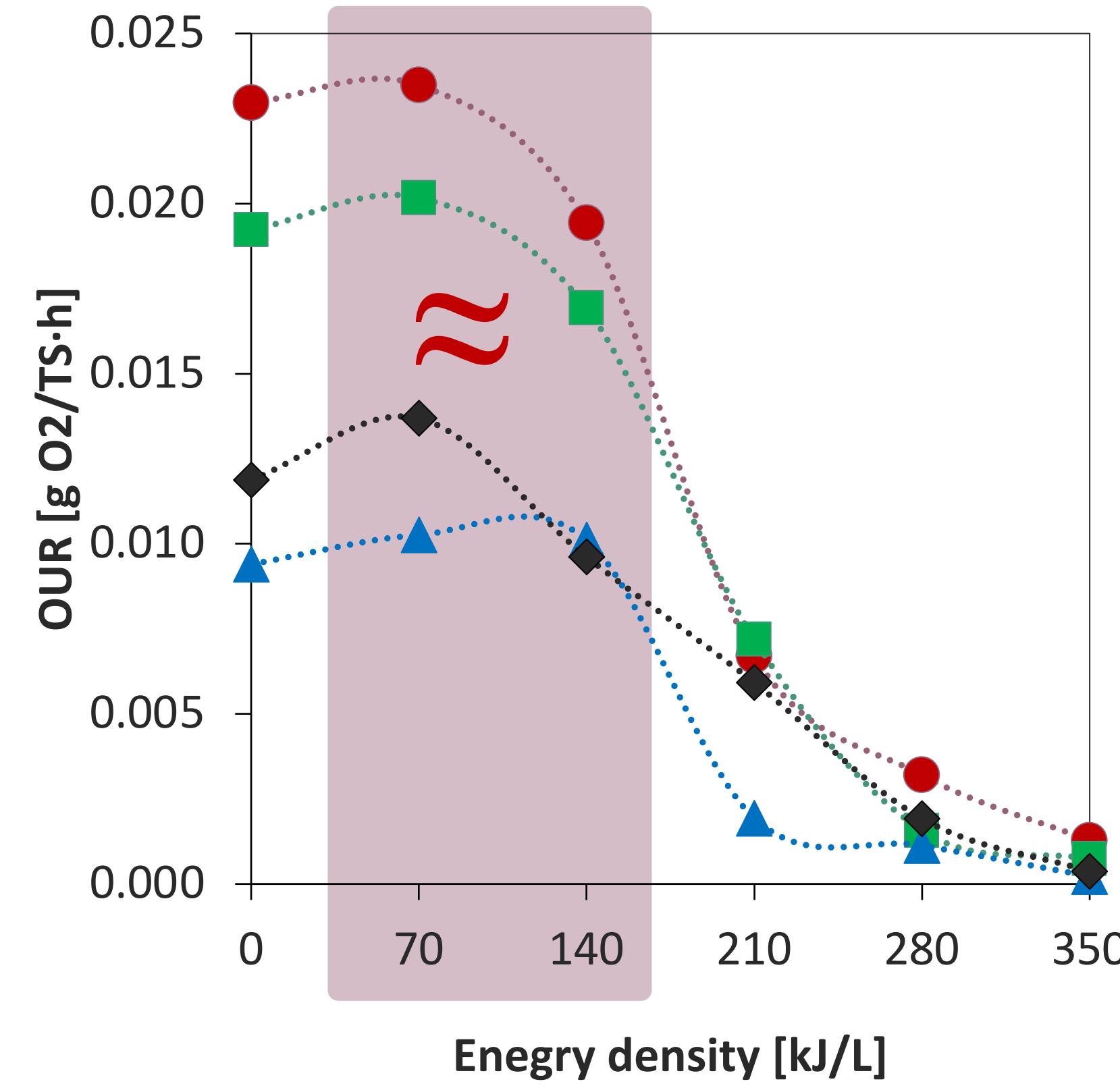
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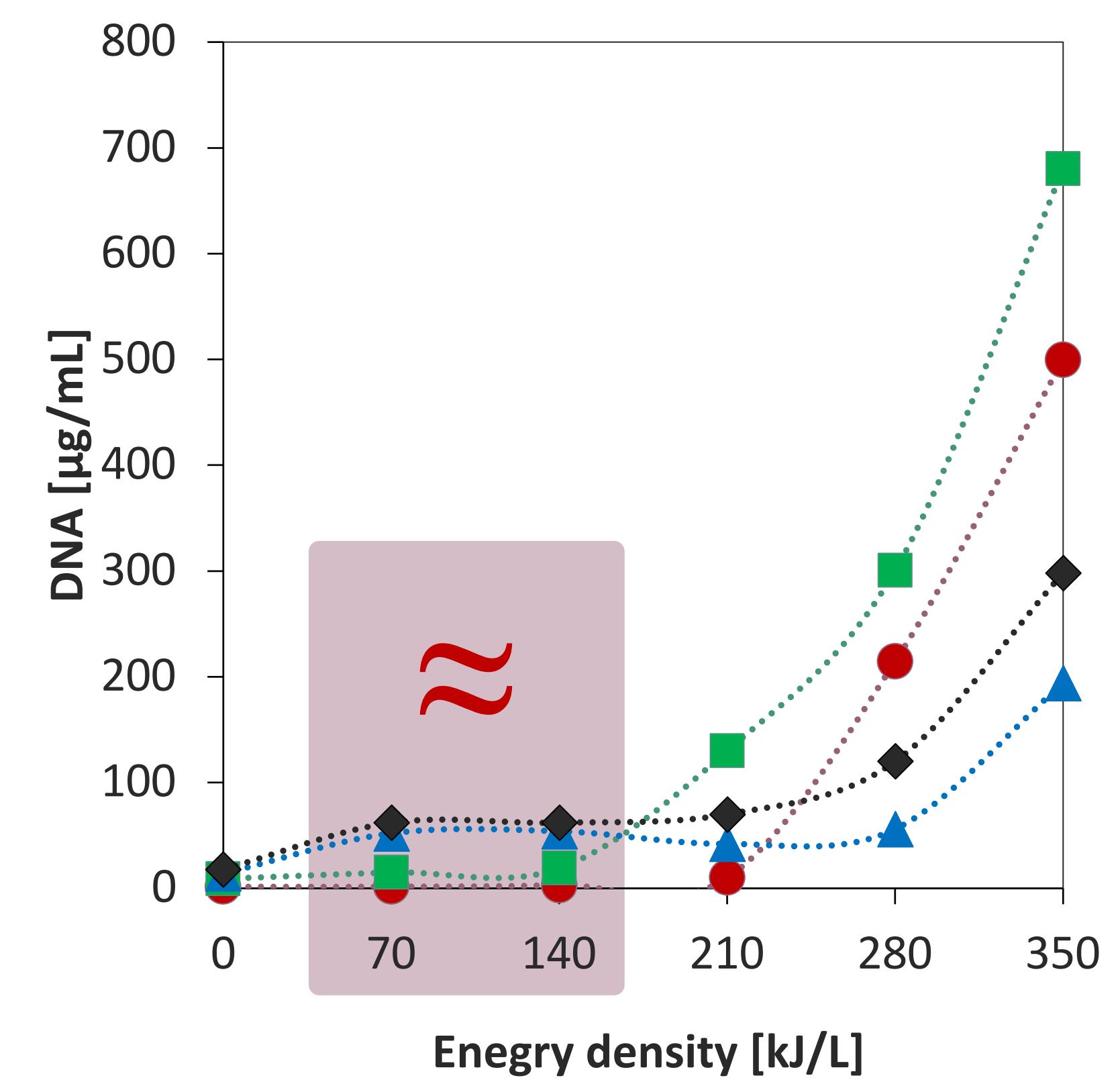
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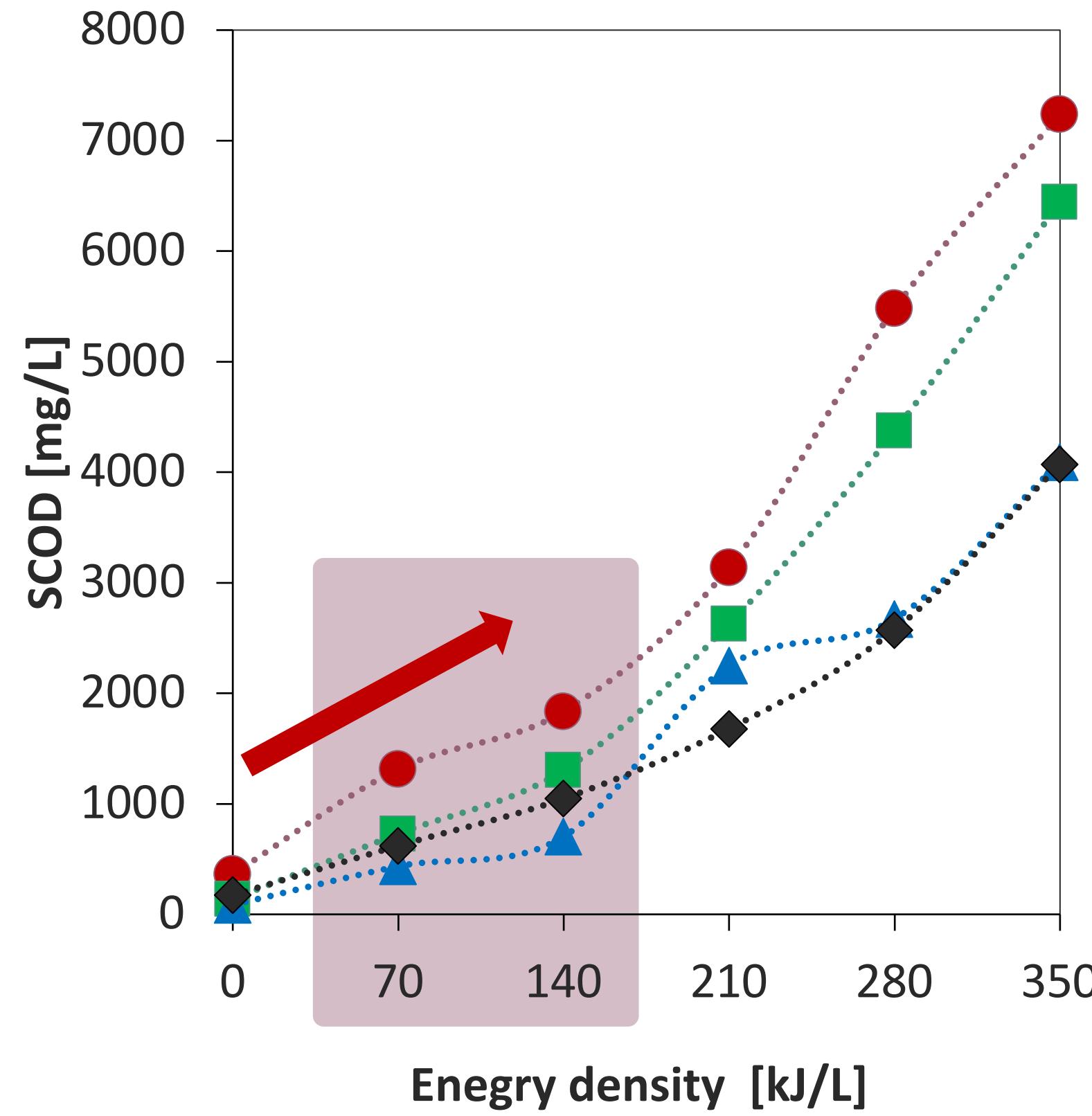
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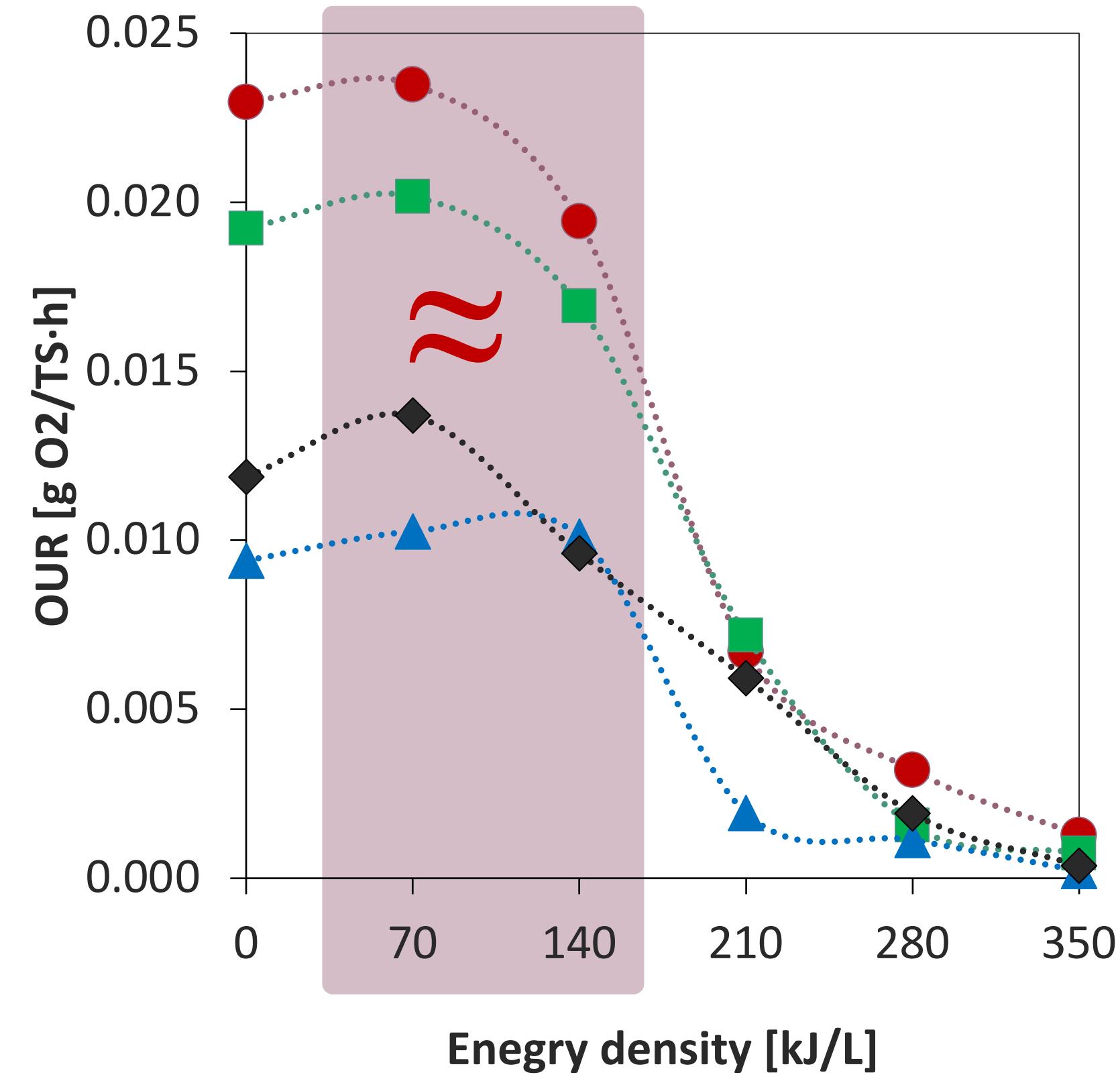
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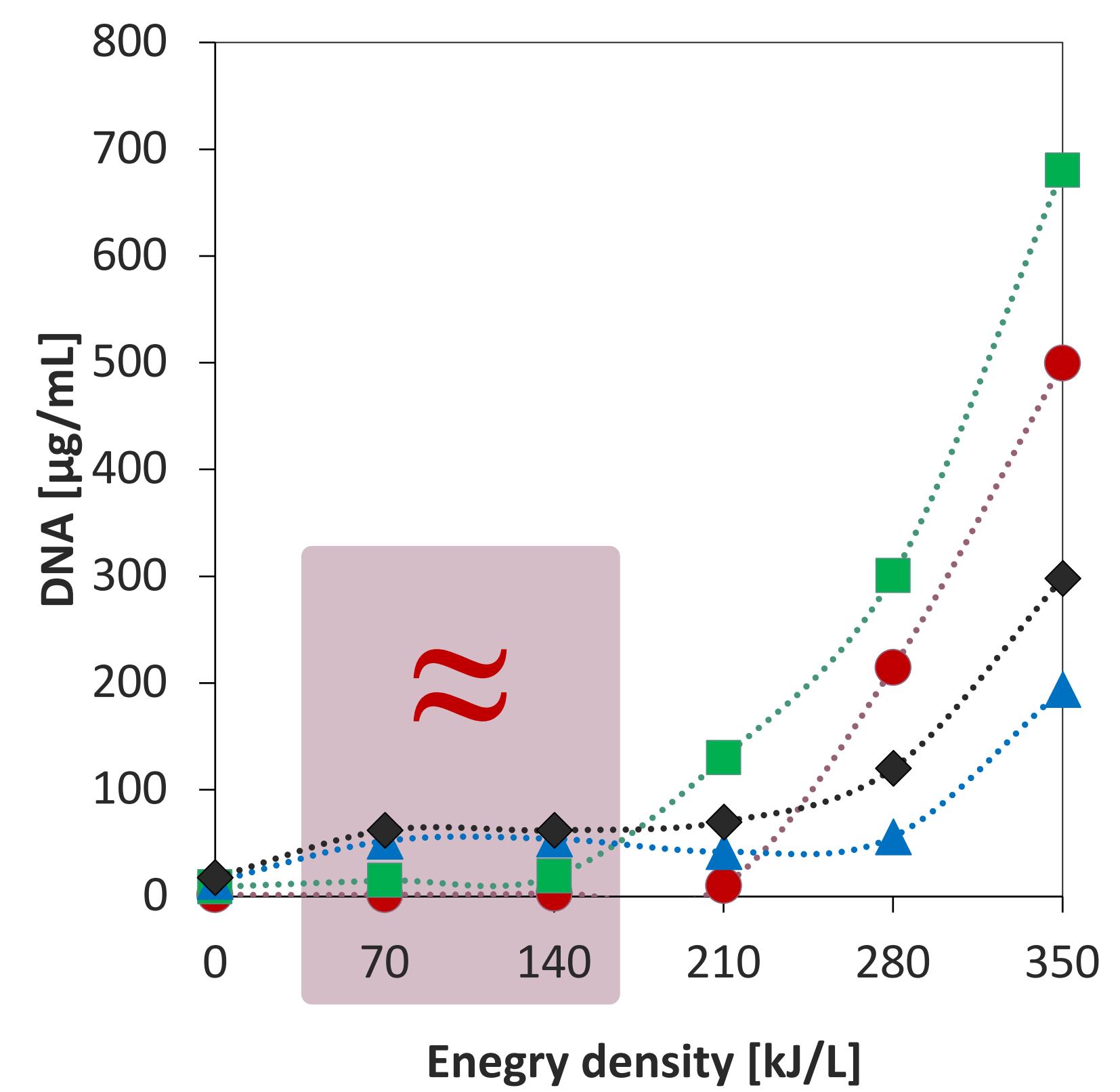
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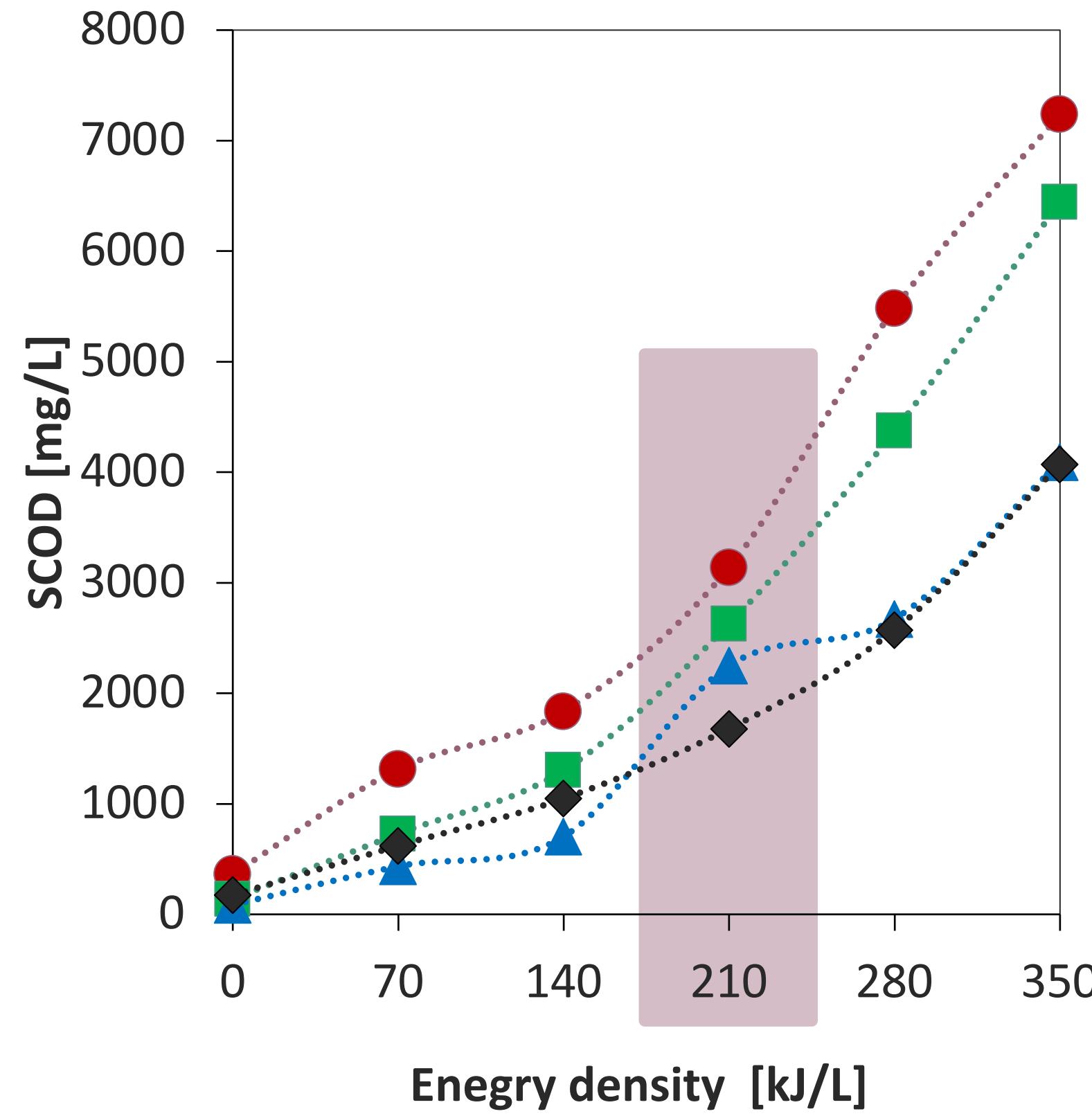
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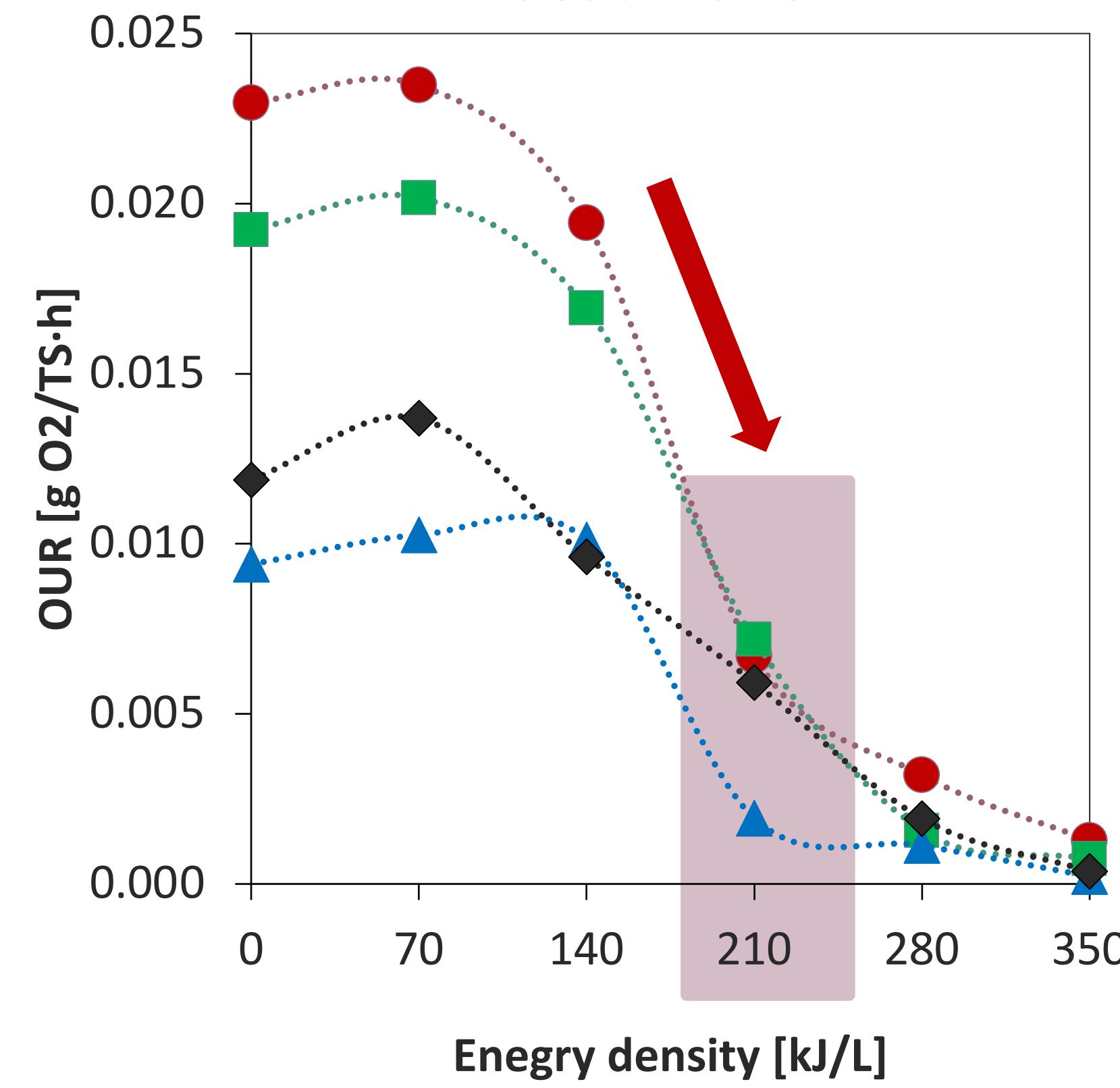
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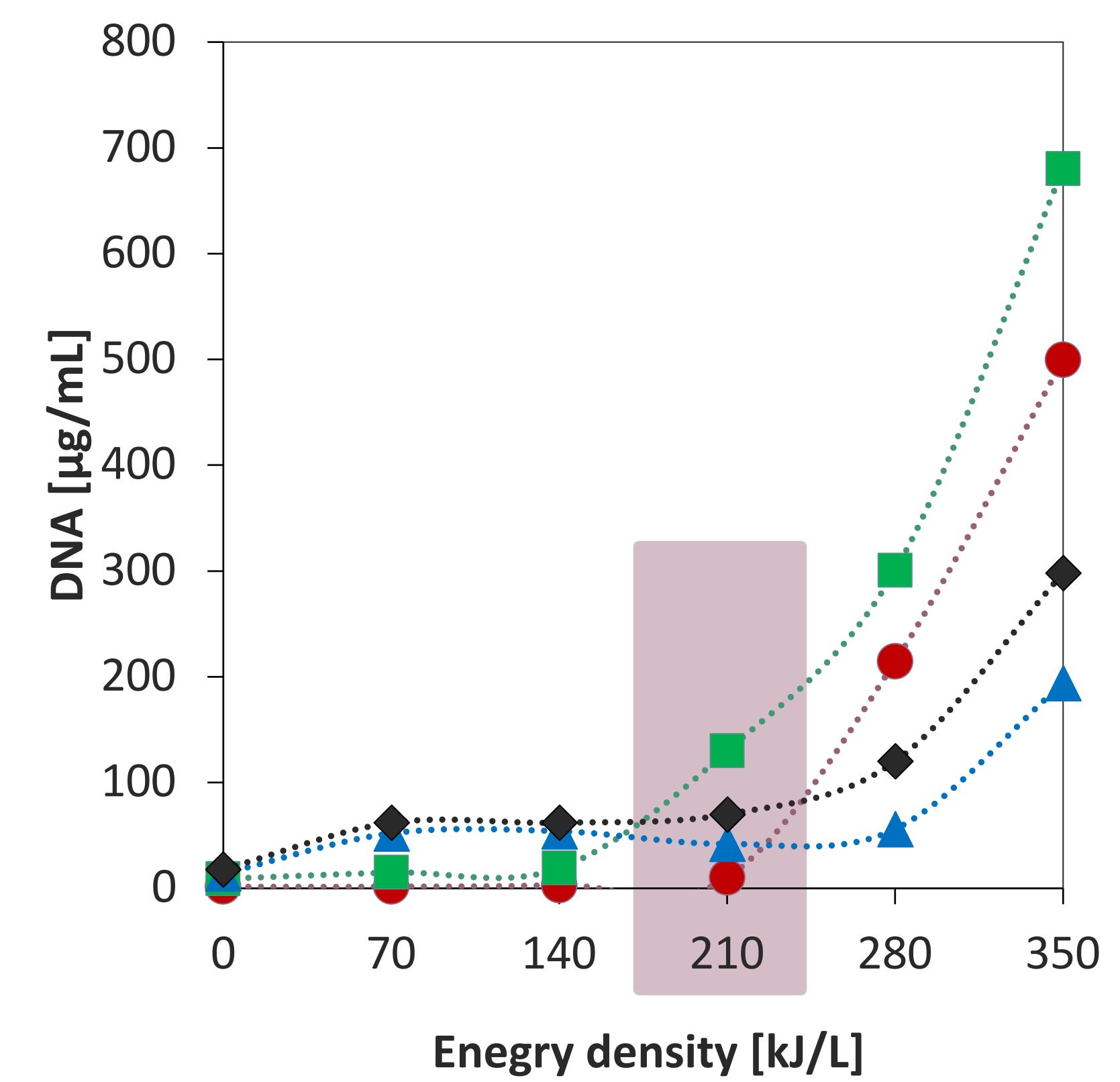
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**Analysis of cell lysis**



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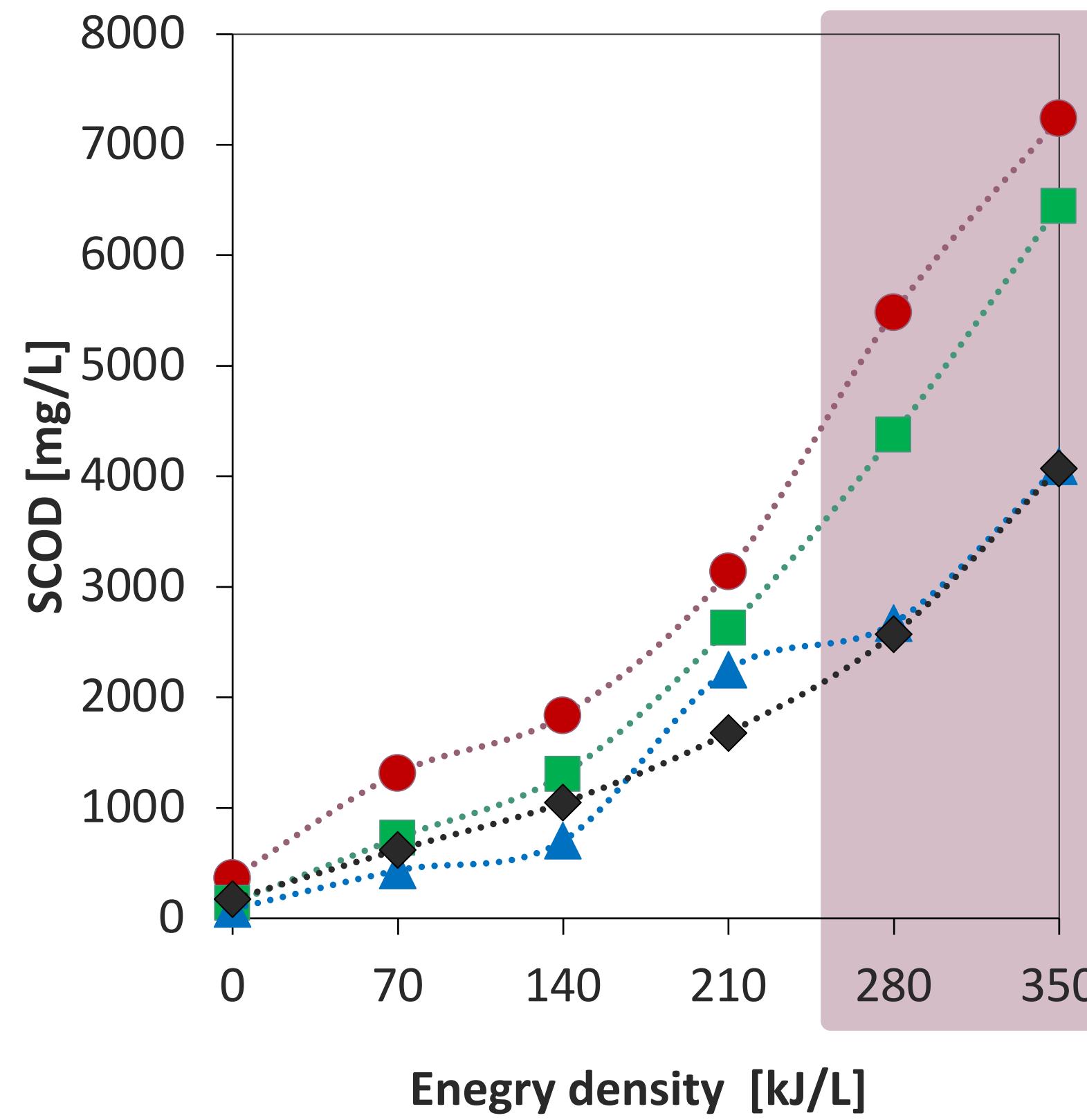
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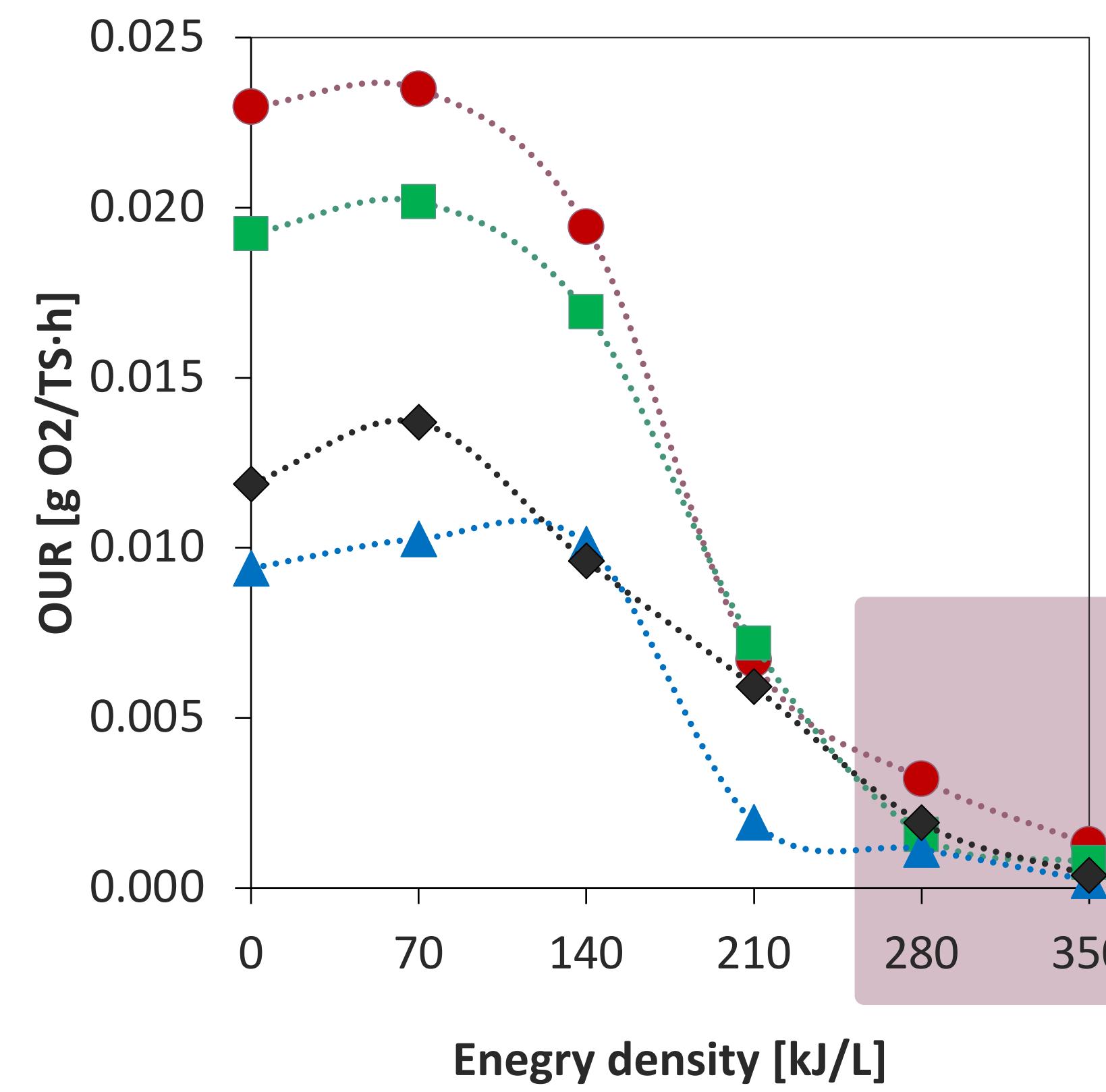
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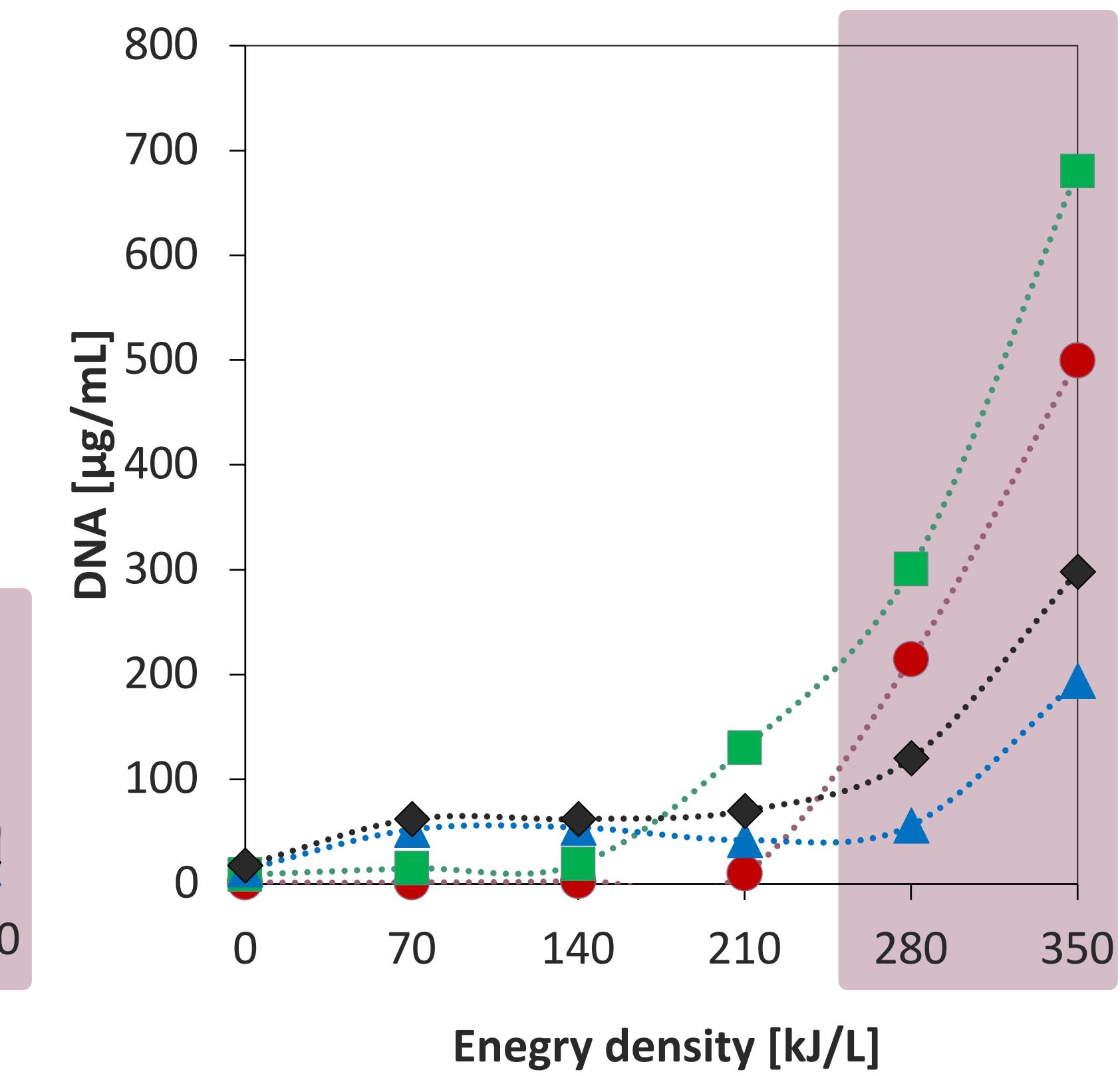
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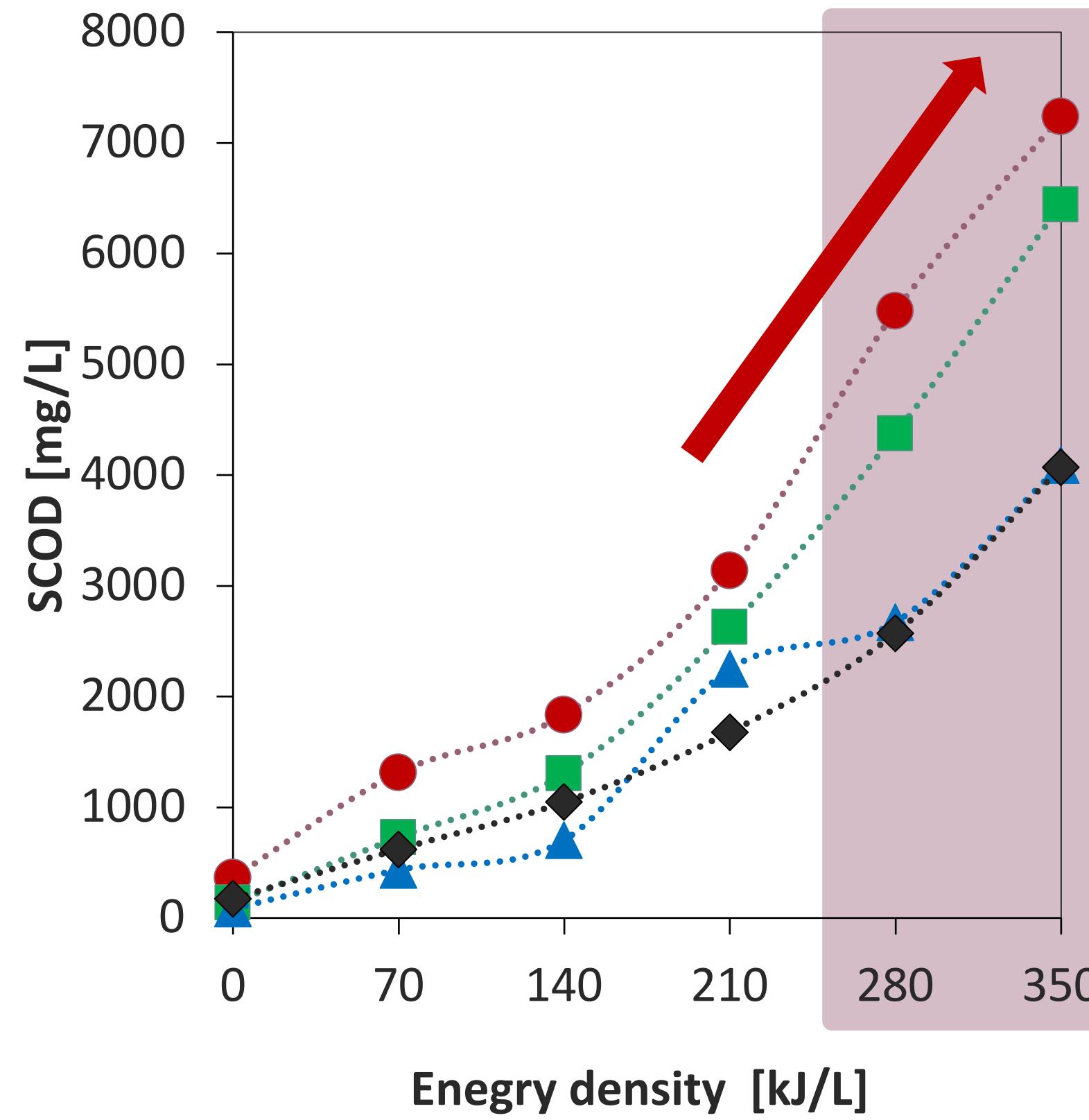
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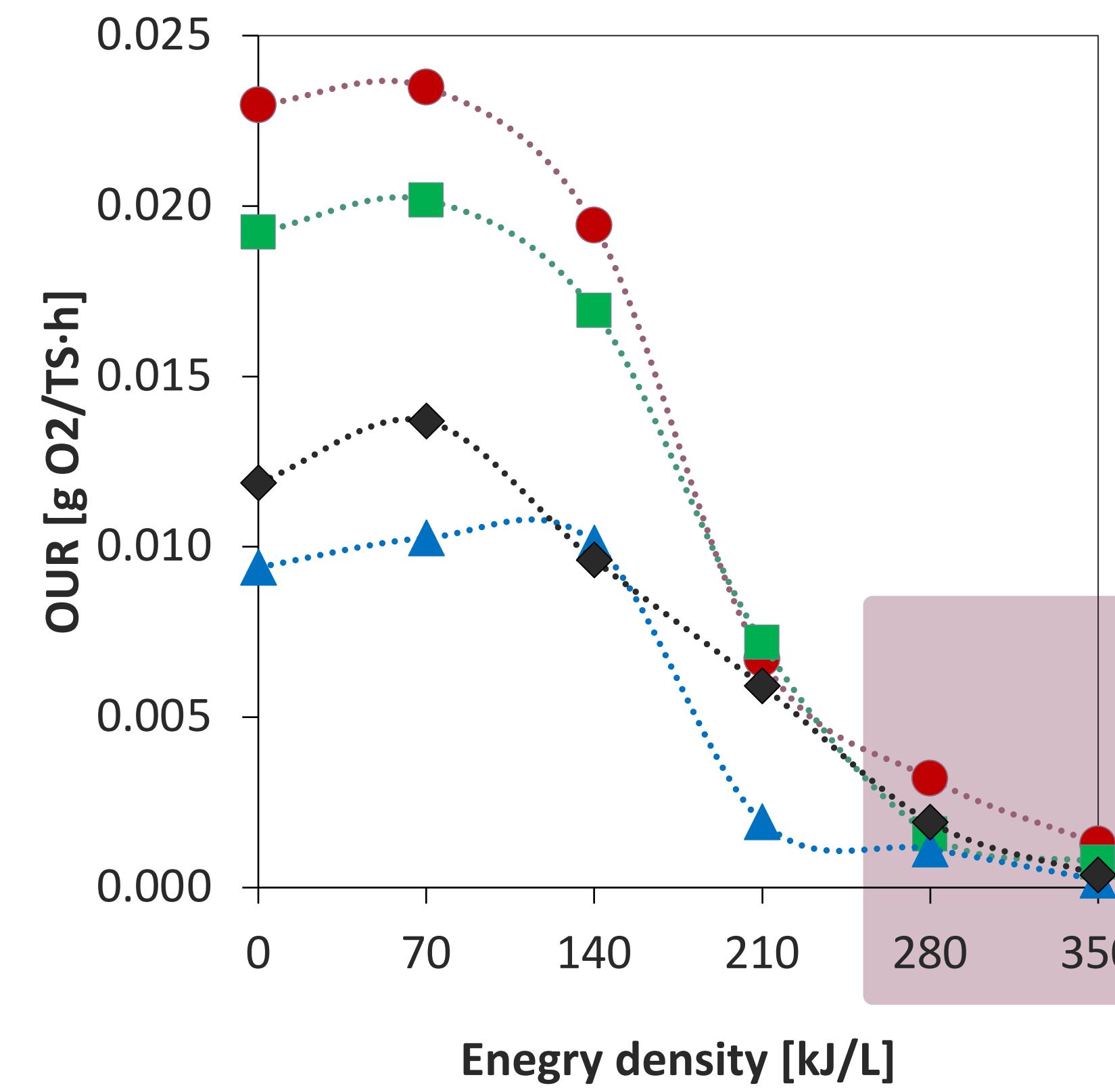
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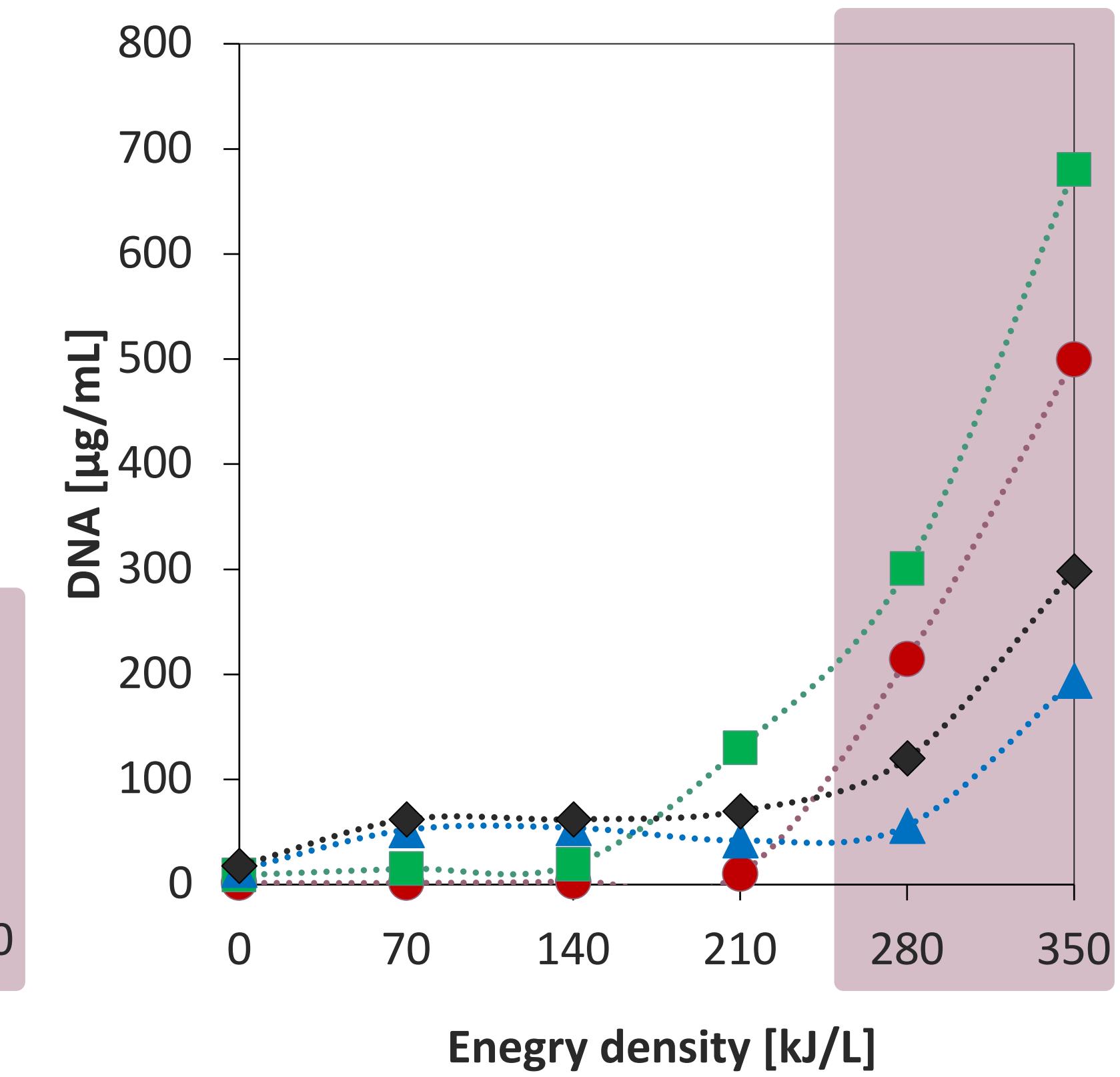
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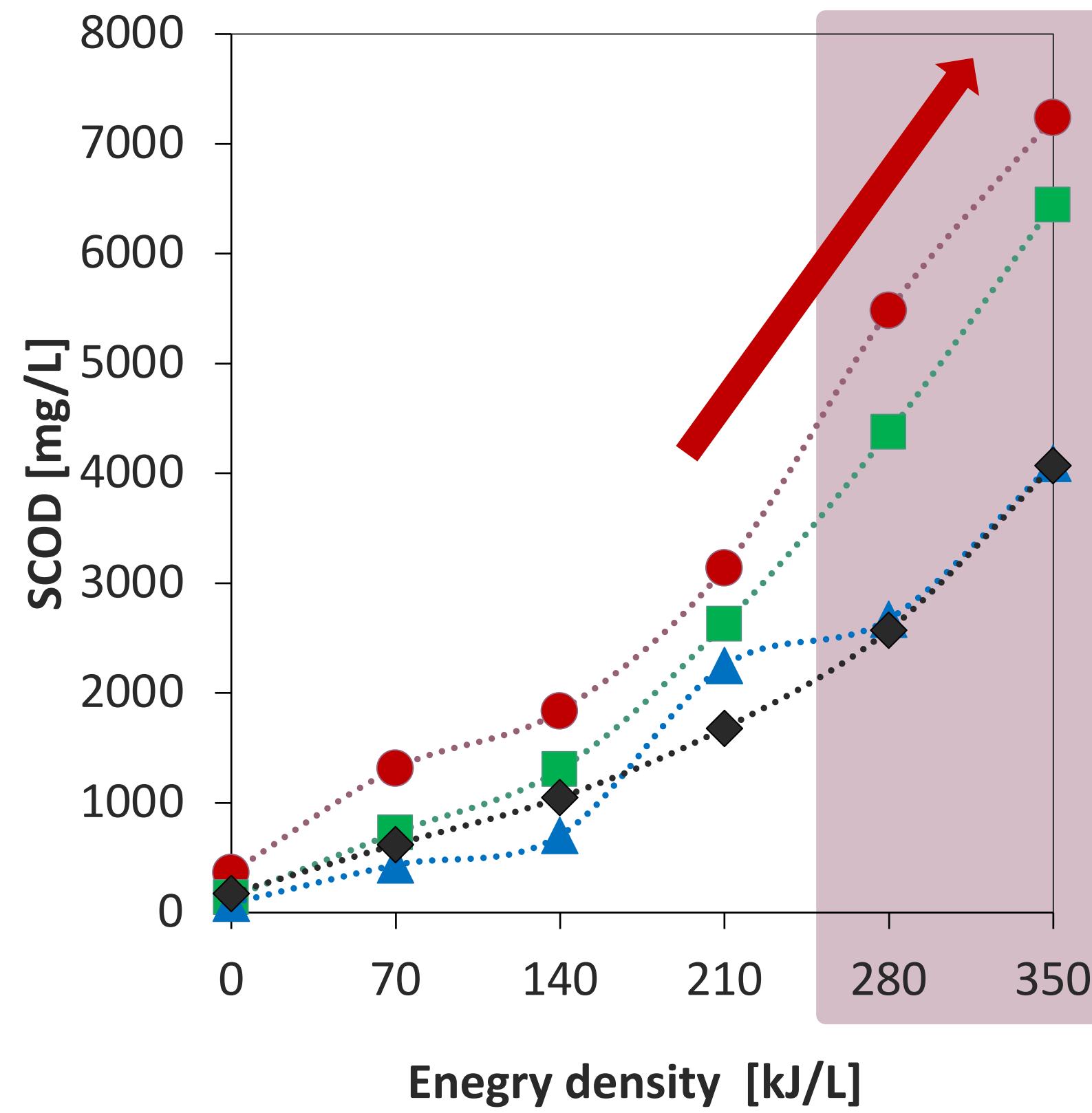
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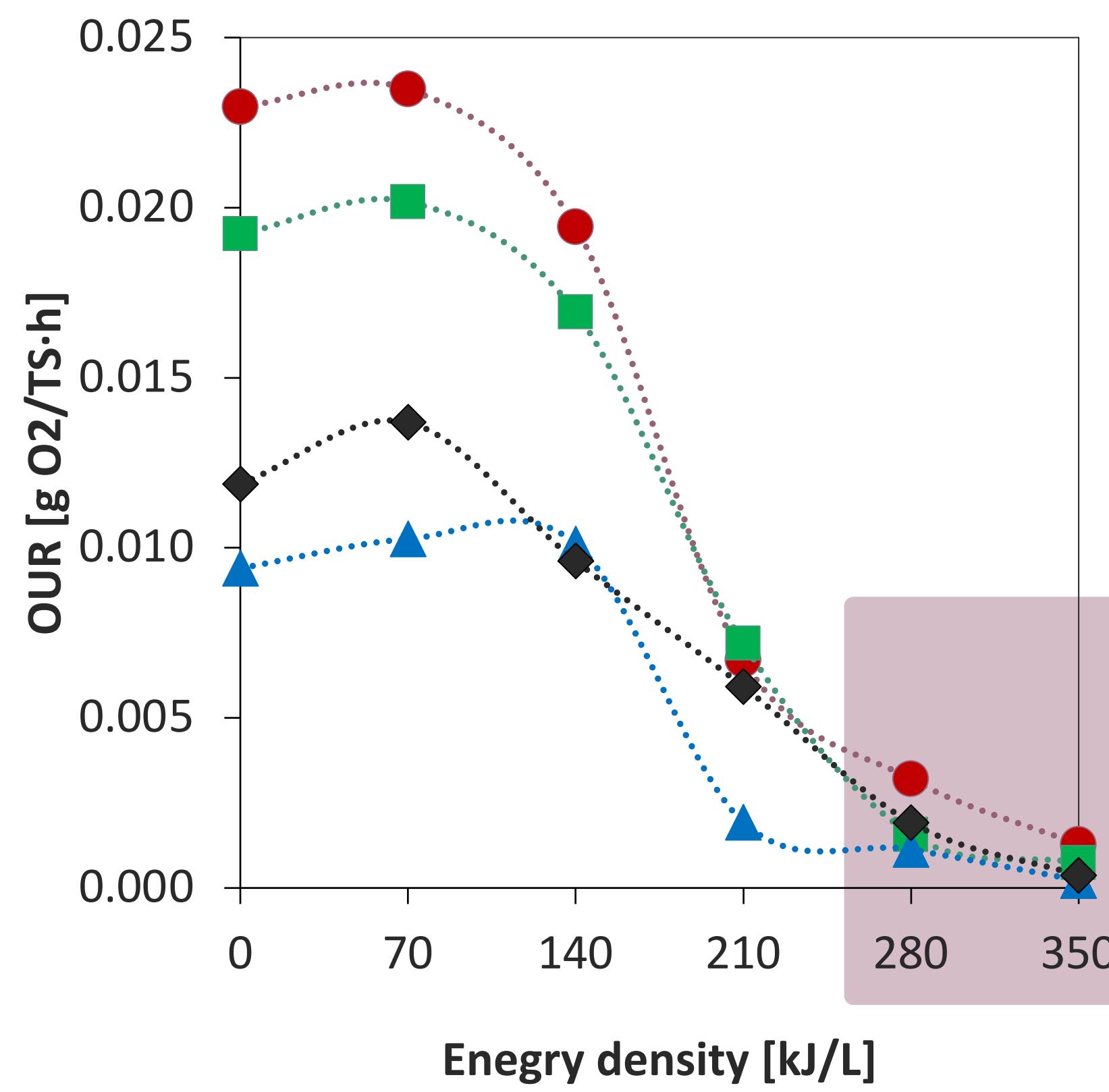
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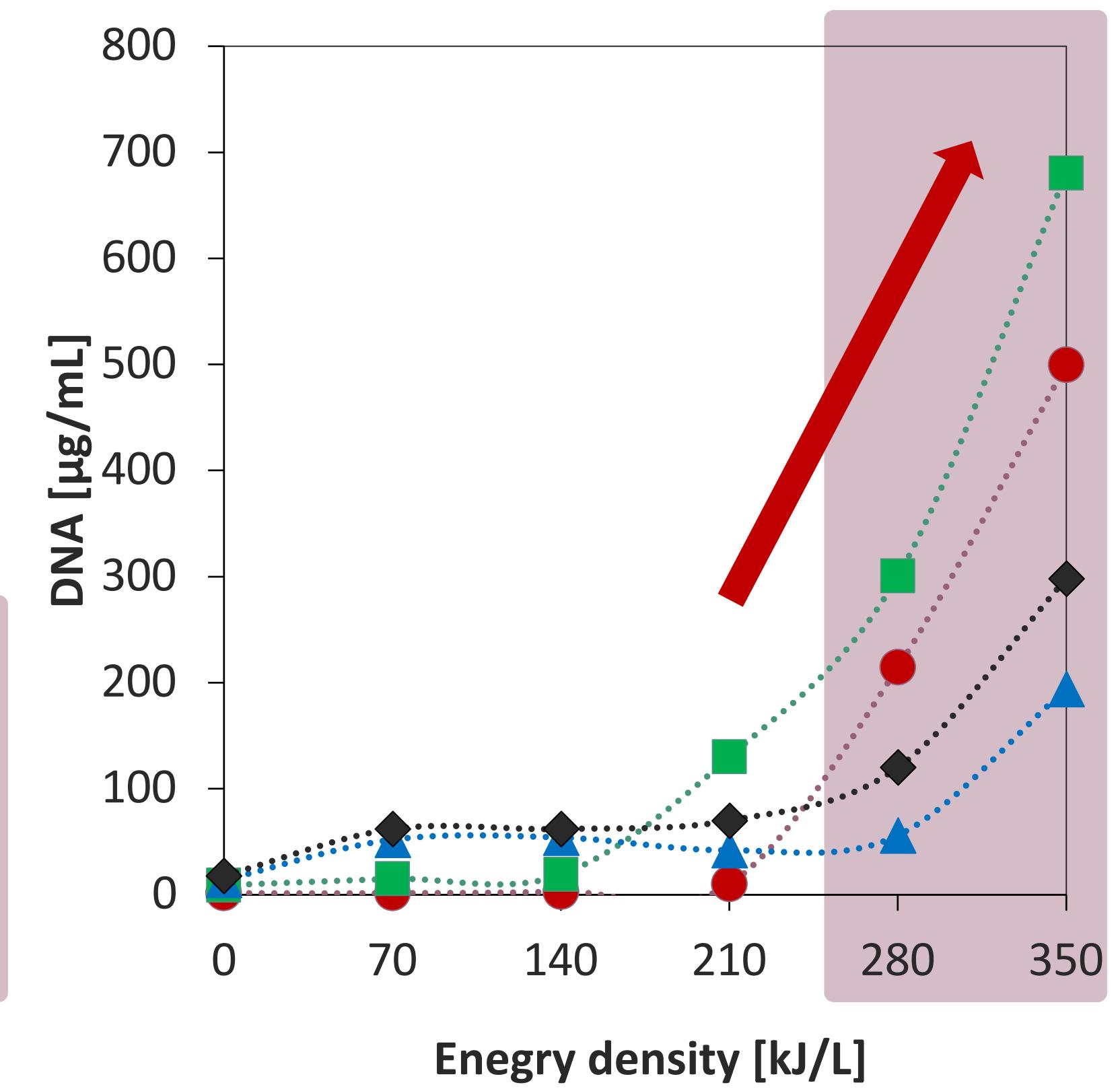
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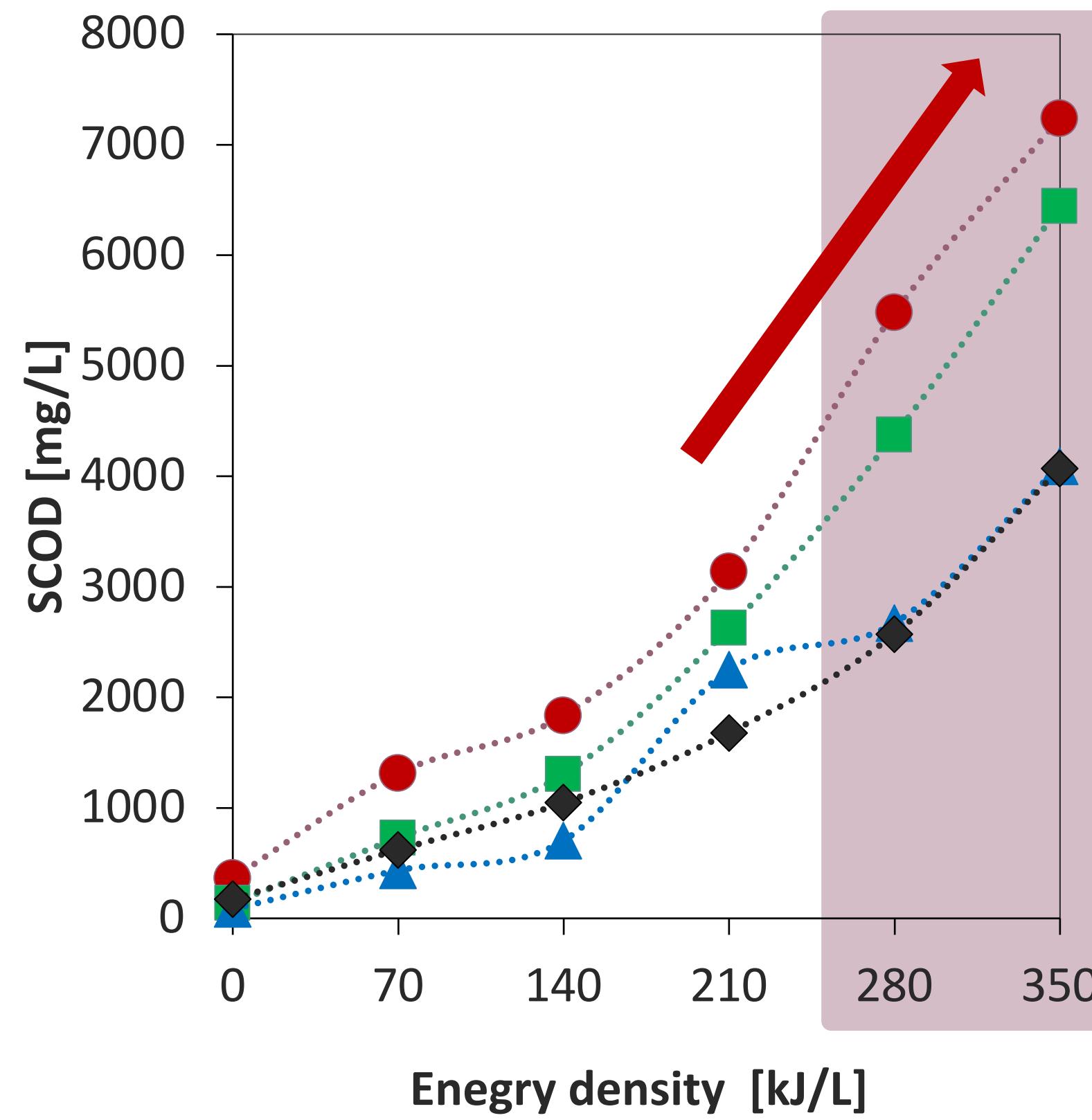
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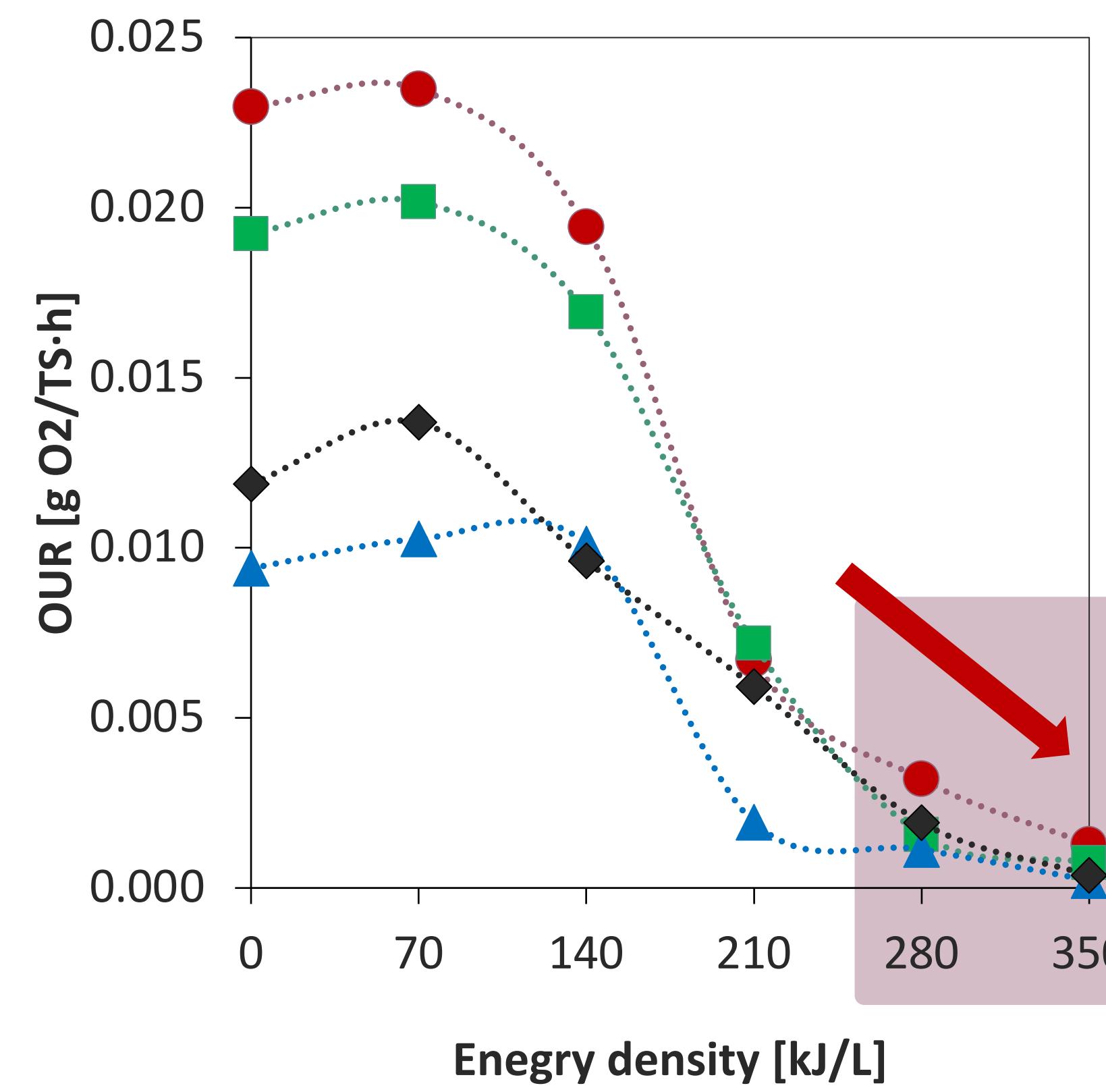
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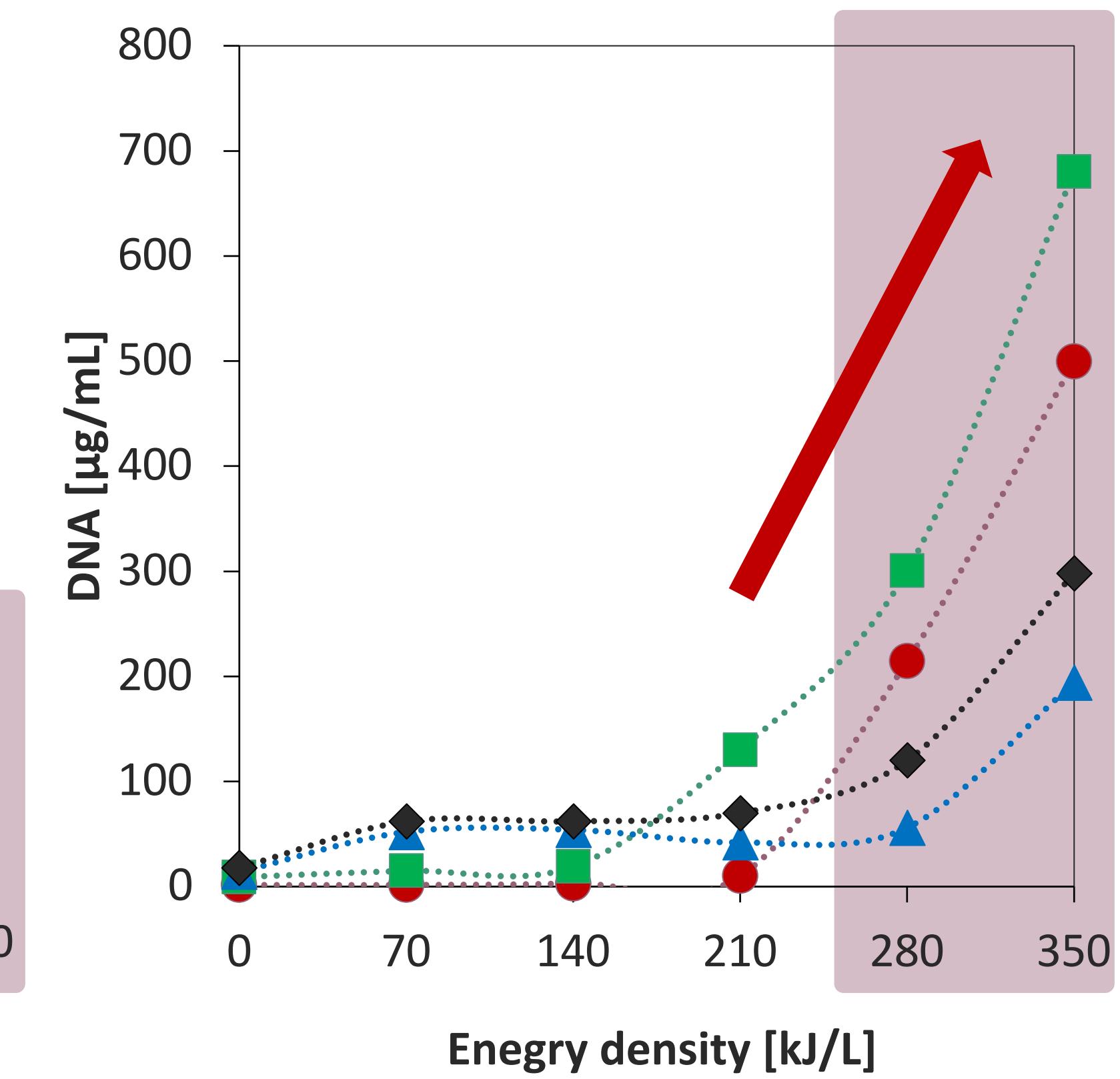
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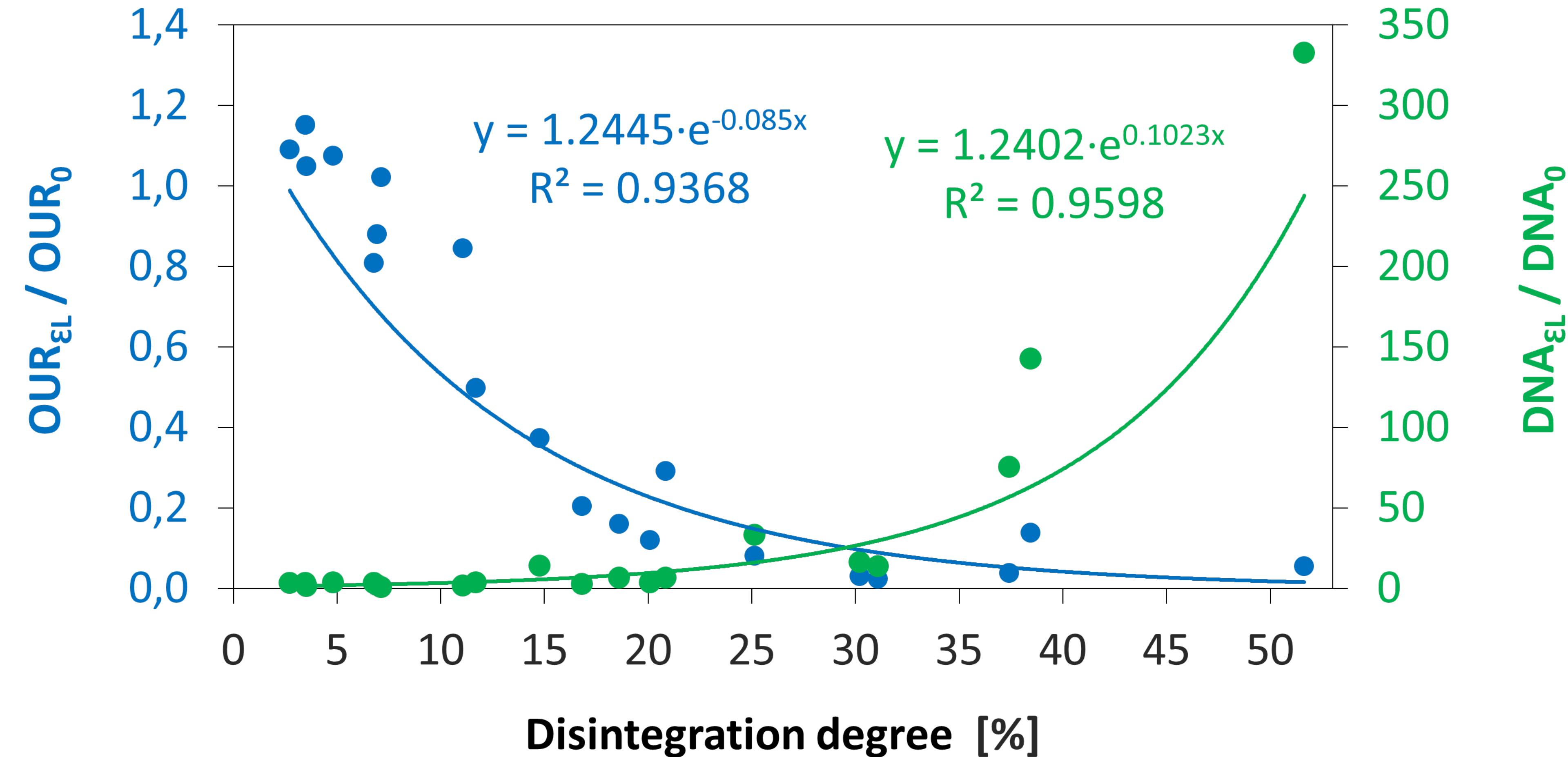
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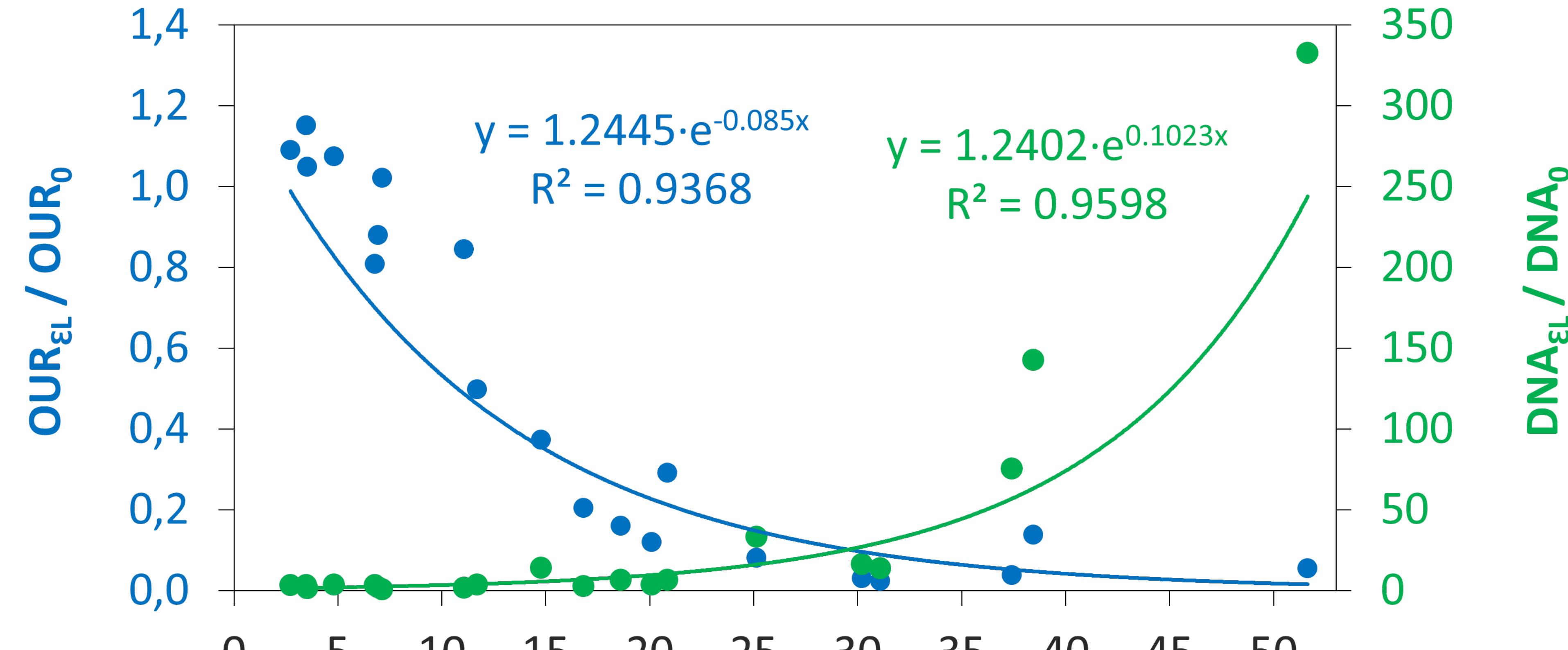
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# RESULTS



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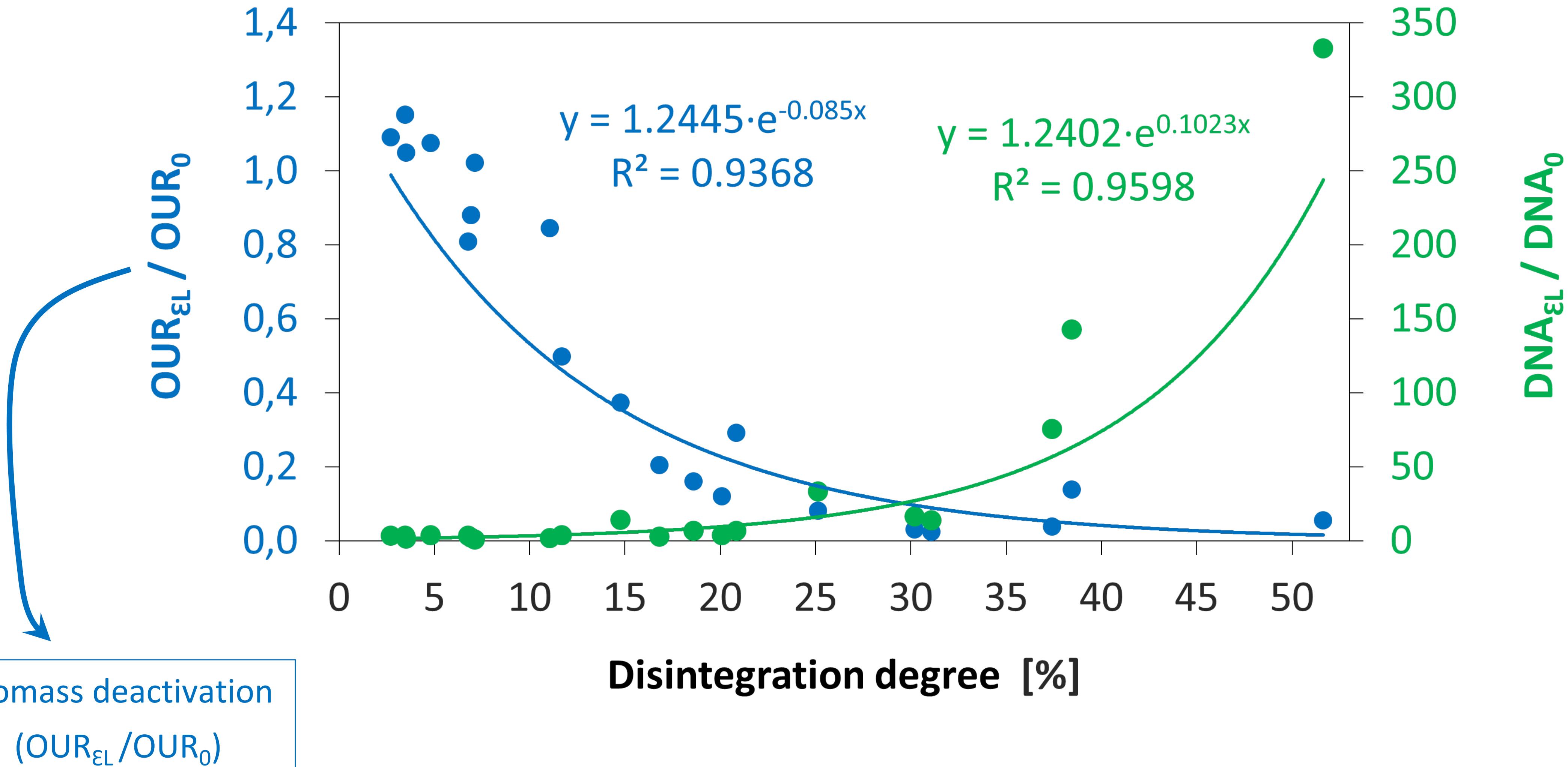


Disintegration degree [%]

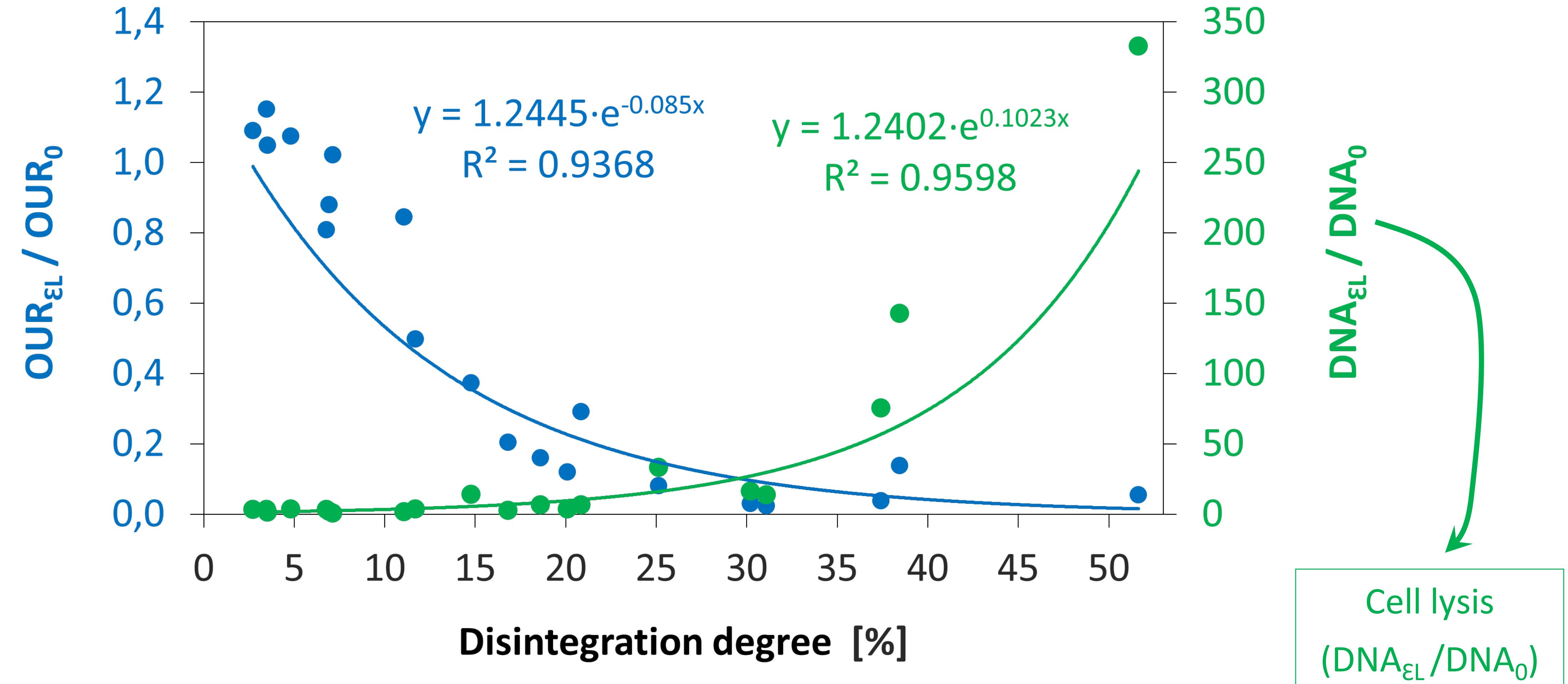
Disintegration degree

$$DD = \frac{(SCOD_{\varepsilon L} - SCOD_0)}{(SCOD_{\text{chemical disintegration}} - SCOD_0)} * 100\%$$

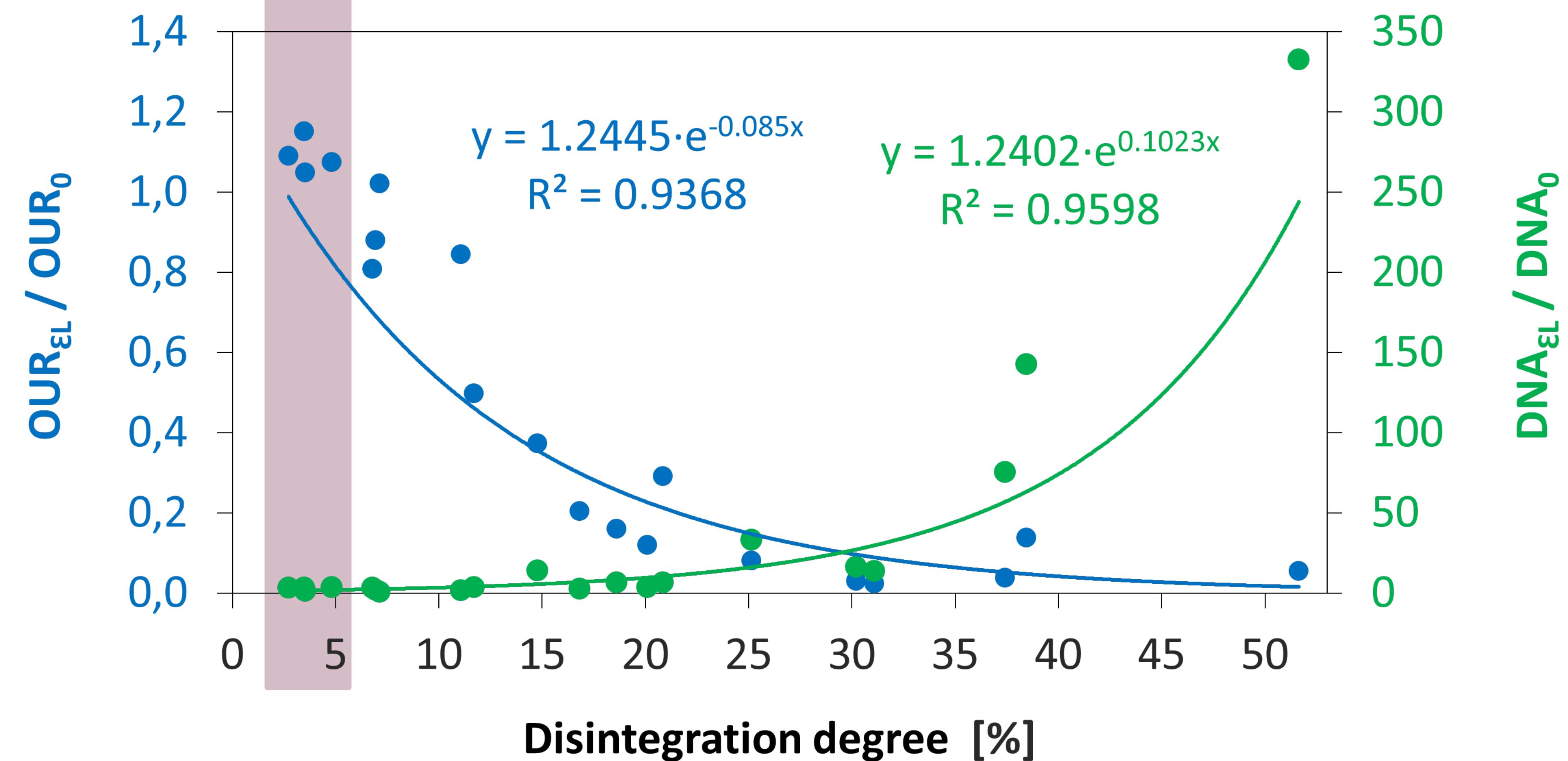
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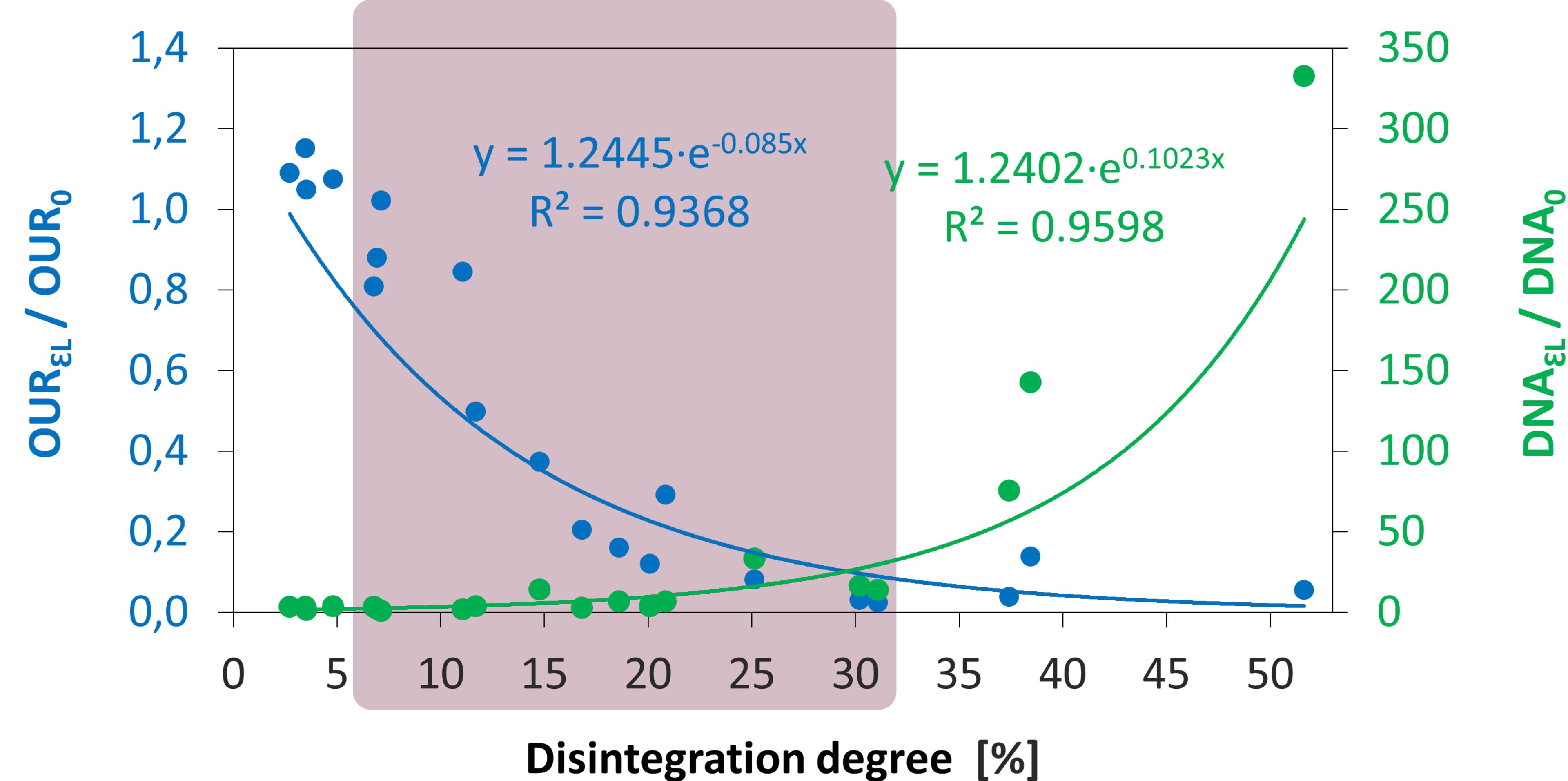
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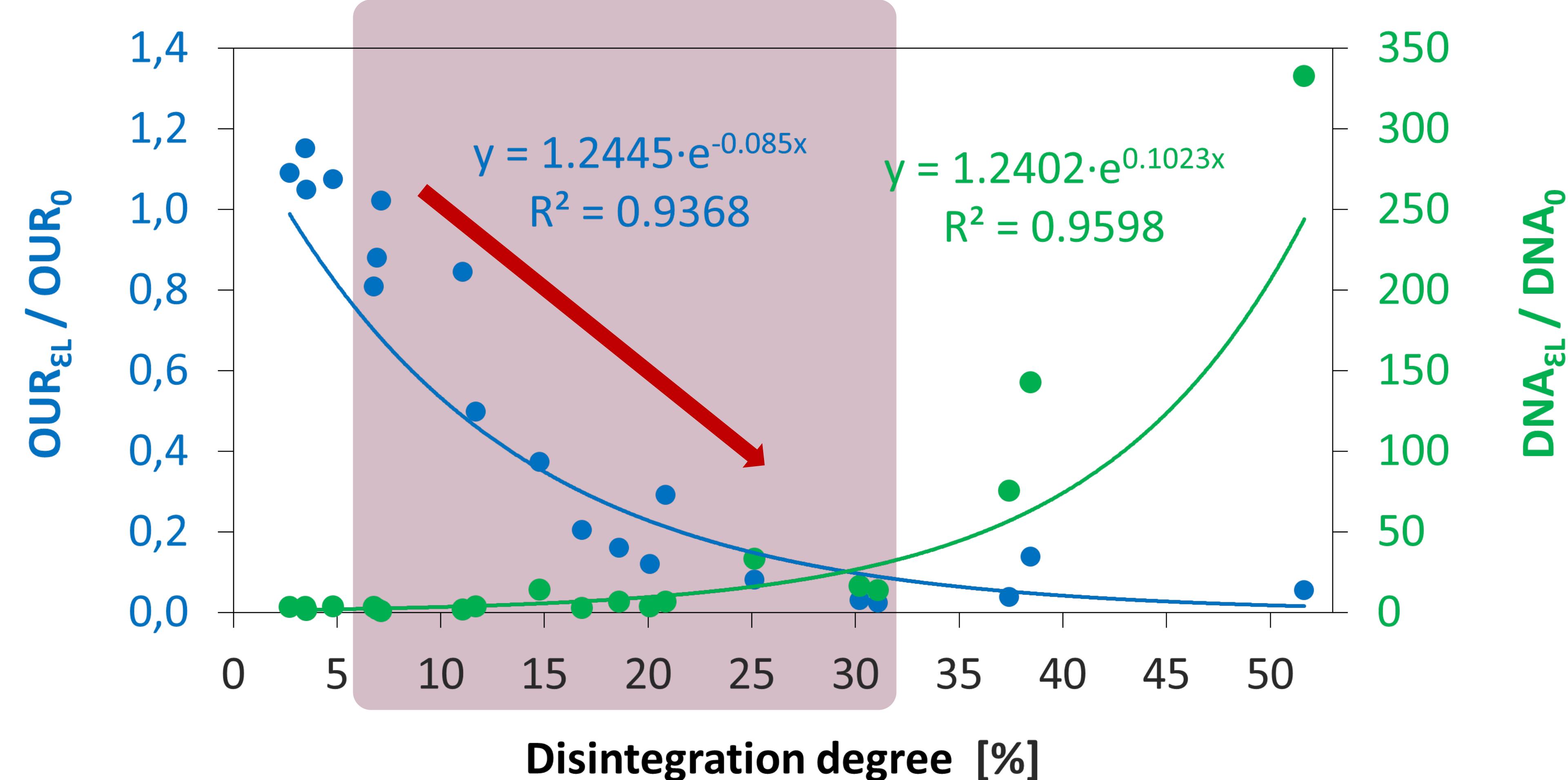
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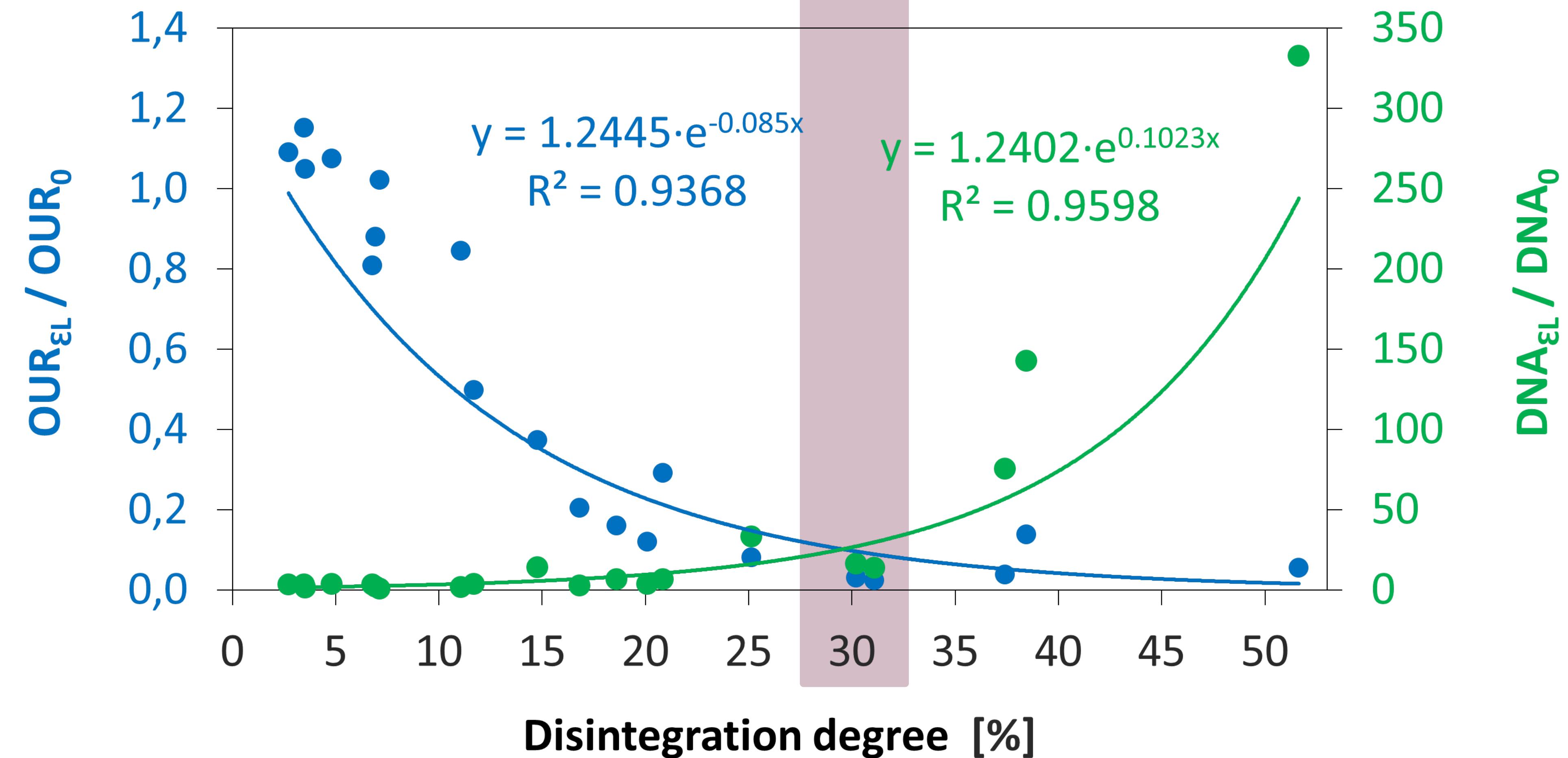
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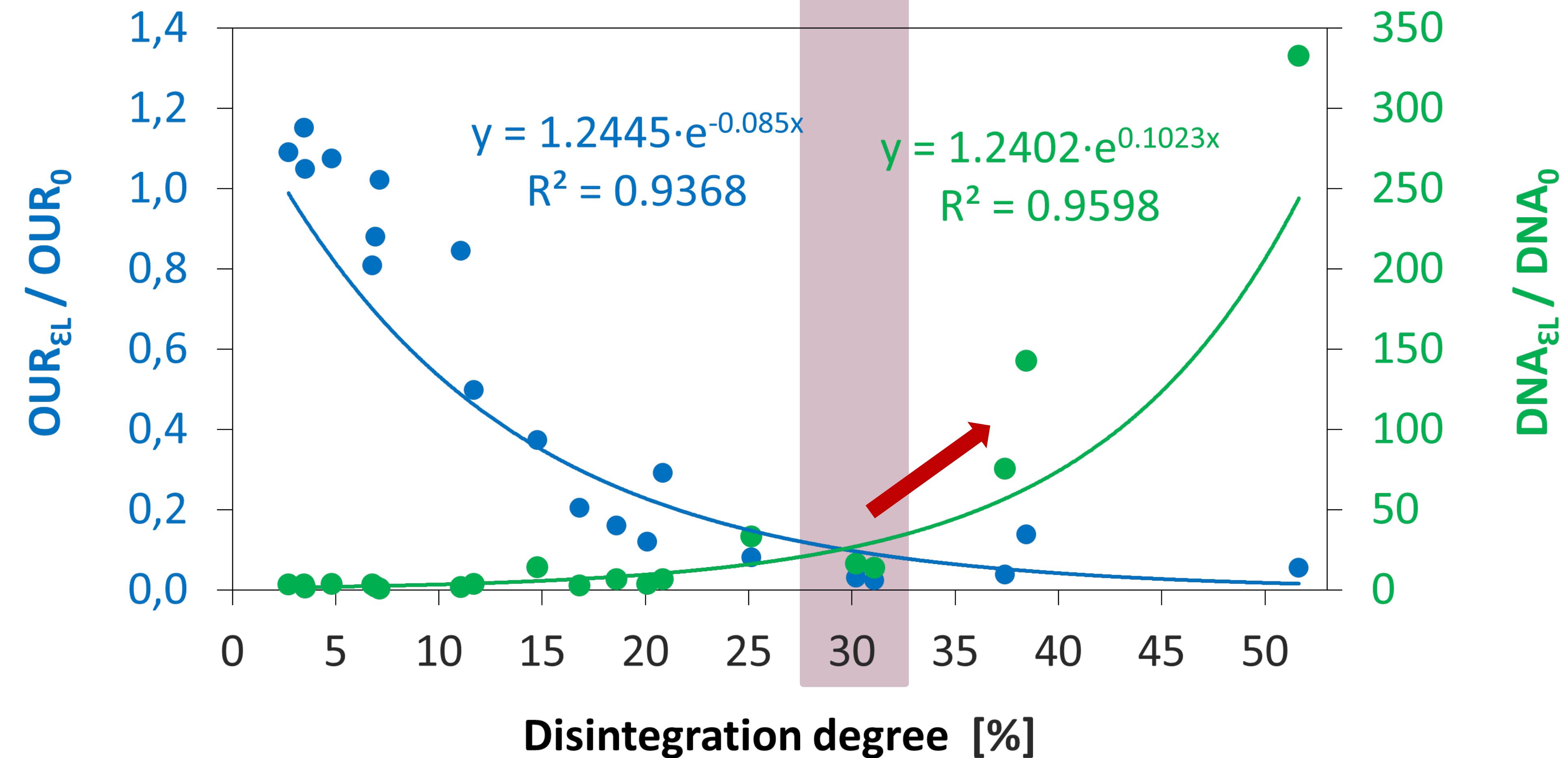
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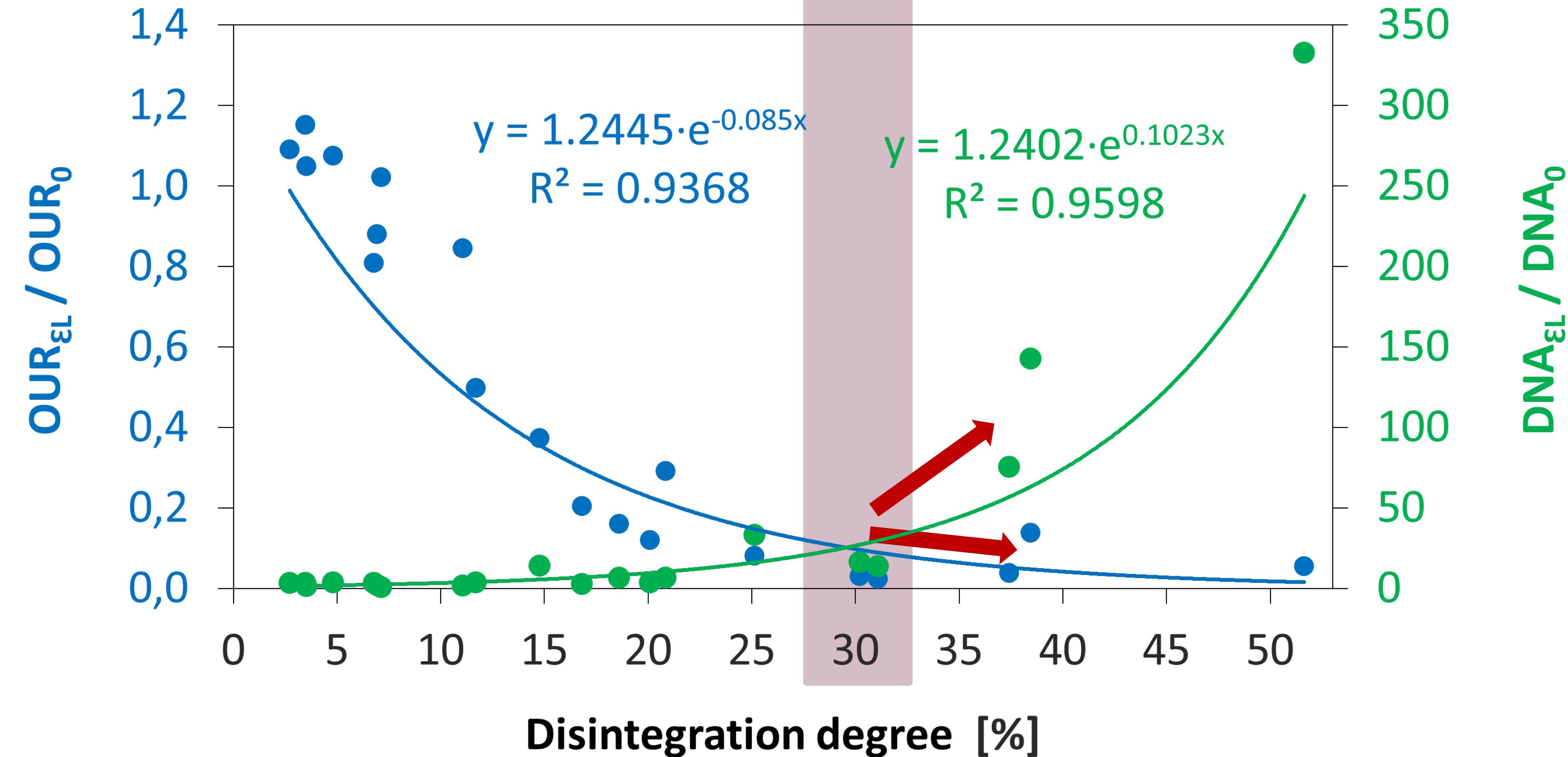
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Observations	Energy density used in the process of disintegration of excess sludge (kJ/L)					
	70	140	210	280	350	
<b>Organic compounds release:</b>						
DD	%	4.0 ± 1.4	7.1 ± 1.9	14.6 ± 3.1	24.9 ± 6.2	37.6 ± 6.6
<b>Deactivation of microorganisms:</b>						
OUR <sub>εL</sub> /OUR <sub>0</sub>	-	1.08 ± 0.06	0.90 ± 0.12	0.34 ± 0.12	0.13 ± 0.03	0.04 ± 0.01
<b>Cell lysis:</b>						
DNA <sub>εL</sub> /DNA <sub>0</sub>	-	2.5 ± 1.3	2.9 ± 0.9	7.0 ± 5.2	46.8 ± 65.5	110 ± 152
<b>C, N and P removal:</b>						
Δn <sub>COD</sub>	%		at a similar level		- 4.6	n.r.a.
Δn <sub>TN</sub>	%	+16.1	+26.7	+17.8	-12.8	n.r.a.
Δn <sub>TP</sub>	%	+70.3	+65.7	+63.1	+63.1	n.r.a.

n.r.a. - no research available

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# CONCLUSION

**The deactivation degree and lysis degree are tools useful for  
the preliminary assessment of potential worsening of the  
quality of treated wastewater in the case of use of  
disintegrated sludge as a carbon source**

# THANK YOU!

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