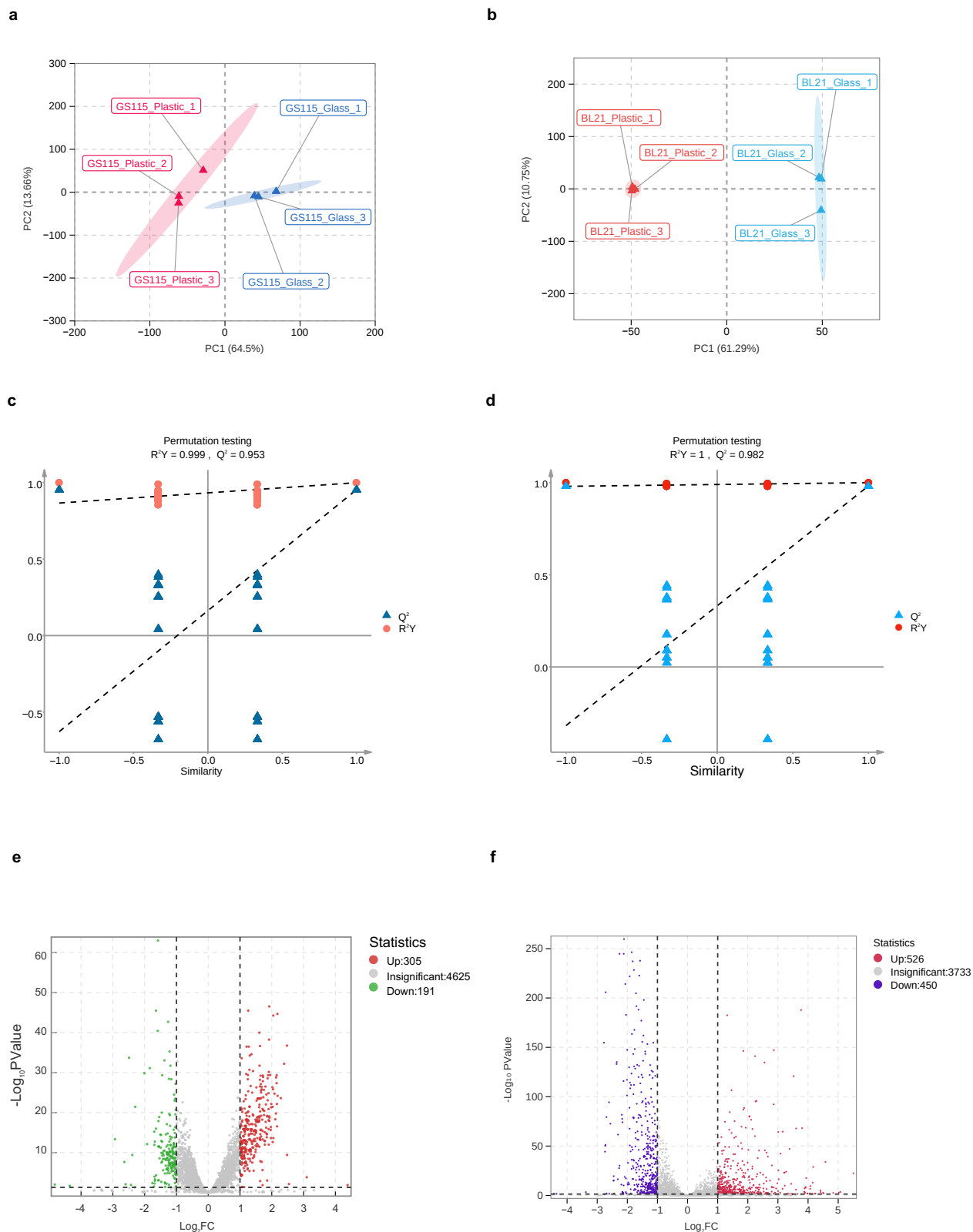
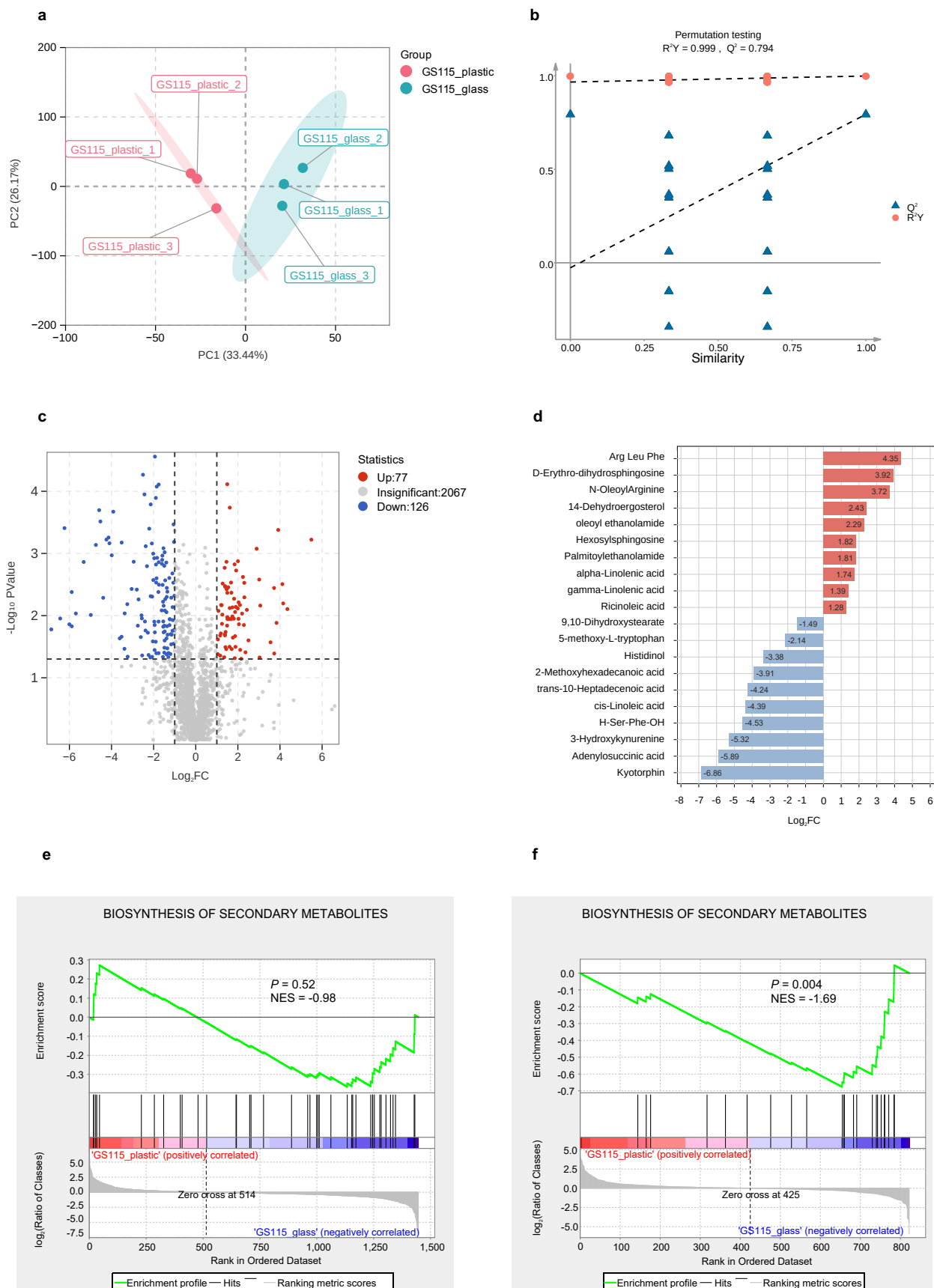




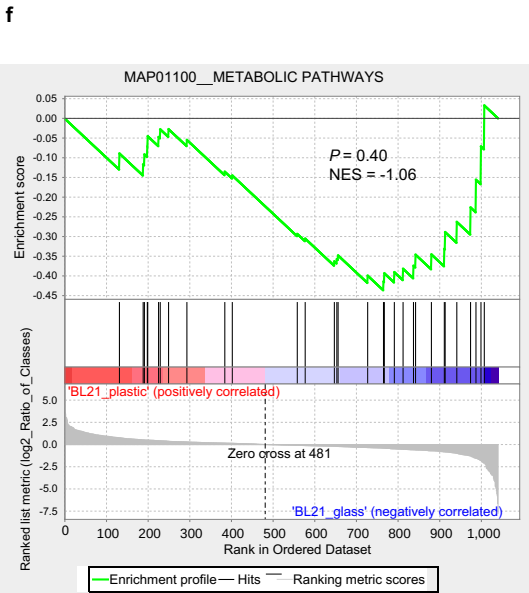
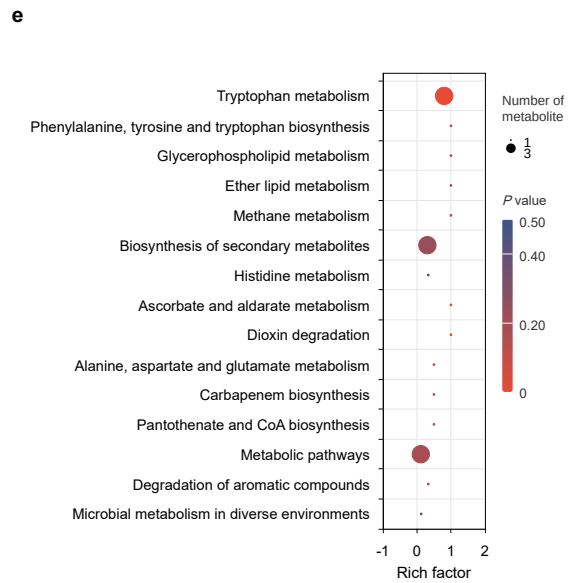
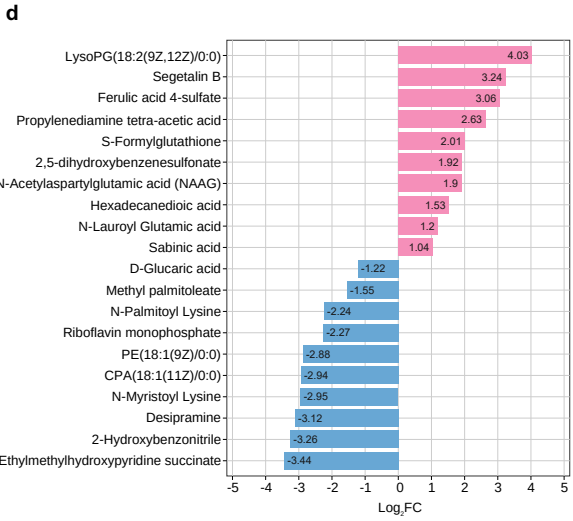
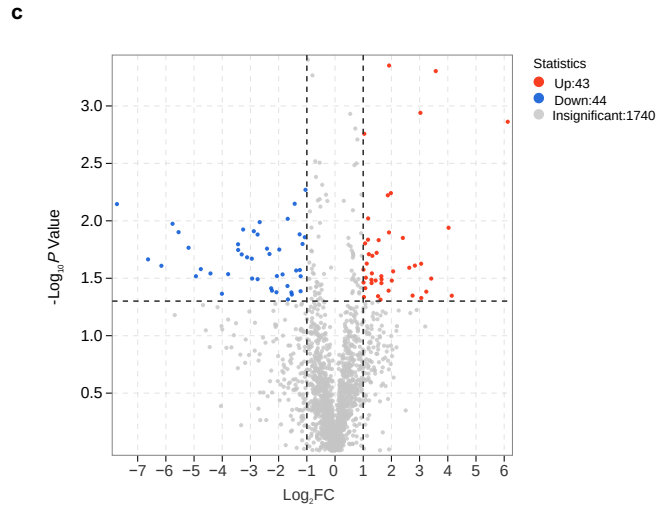
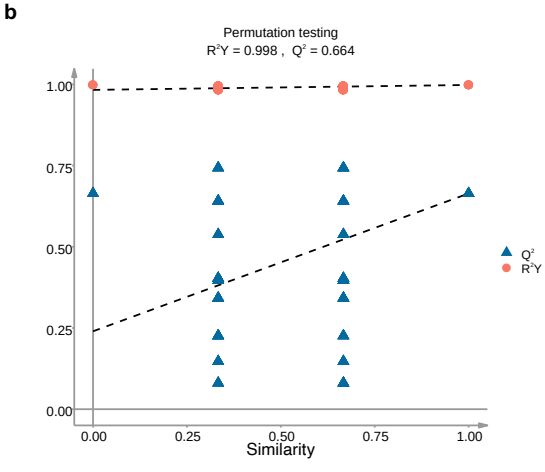
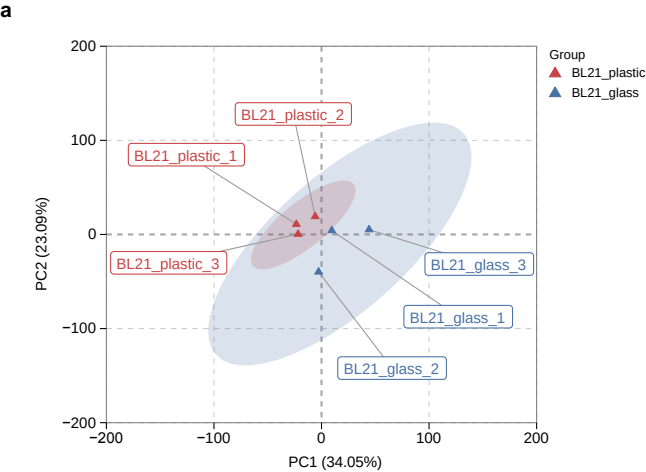
Extended Data Fig.1 Container material induces global transcriptomic divergence in *P. pastoris* GS115 and *E. coli* BL21.

a, Principal component analysis of GS115 transcriptomes cultured in polypropylene or glass vessels showing clear segregation along PC1. **b**, Principal component analysis of BL21 transcriptomes revealing material-dependent separation. **c**, OPLS DA permutation test for GS115 confirming model robustness and excluding overfitting. **d**, OPLS DA permutation test for BL21. **e**, Volcano plot of GS115 highlighting significantly upregulated and downregulated genes under polypropylene culture. **f**, Volcano plot of BL21 showing differential gene expression patterns between polypropylene and glass conditions.



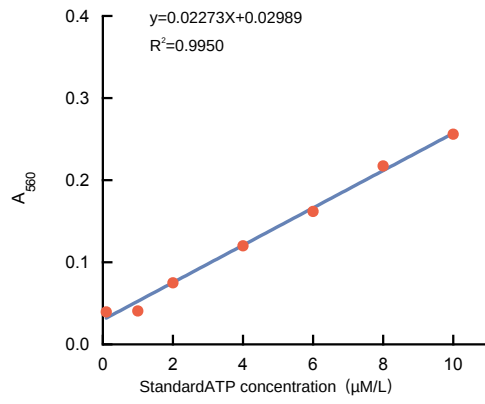
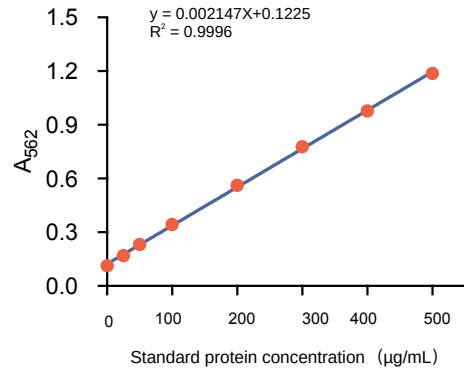
Extended Data Fig.2 Untargeted metabolomics profiling of *P. pastoris* GS115 cultured in polypropylene containers.

a, PCA showing global metabolic separation between GS115 cells cultured in polypropylene and glass containers. **b**, OPLS-DA permutation test validating model robustness and excluding overfitting. **c**, Volcano plot highlighting significantly altered metabolites ($|\log_2FC| \geq 1$; $P < 0.05$). **d**, Bar plots of representative differential metabolites highlighting coordinated alterations in energy-related and lipid-associated metabolites. **e-f**, GSEA of KEGG metabolic pathways based on metabolite-level ranking. Enrichment plots are shown for Biosynthesis of secondary metabolites (map01110) derived from both positive ion mode (POS; **e**) and negative ion mode (NEG; **f**).



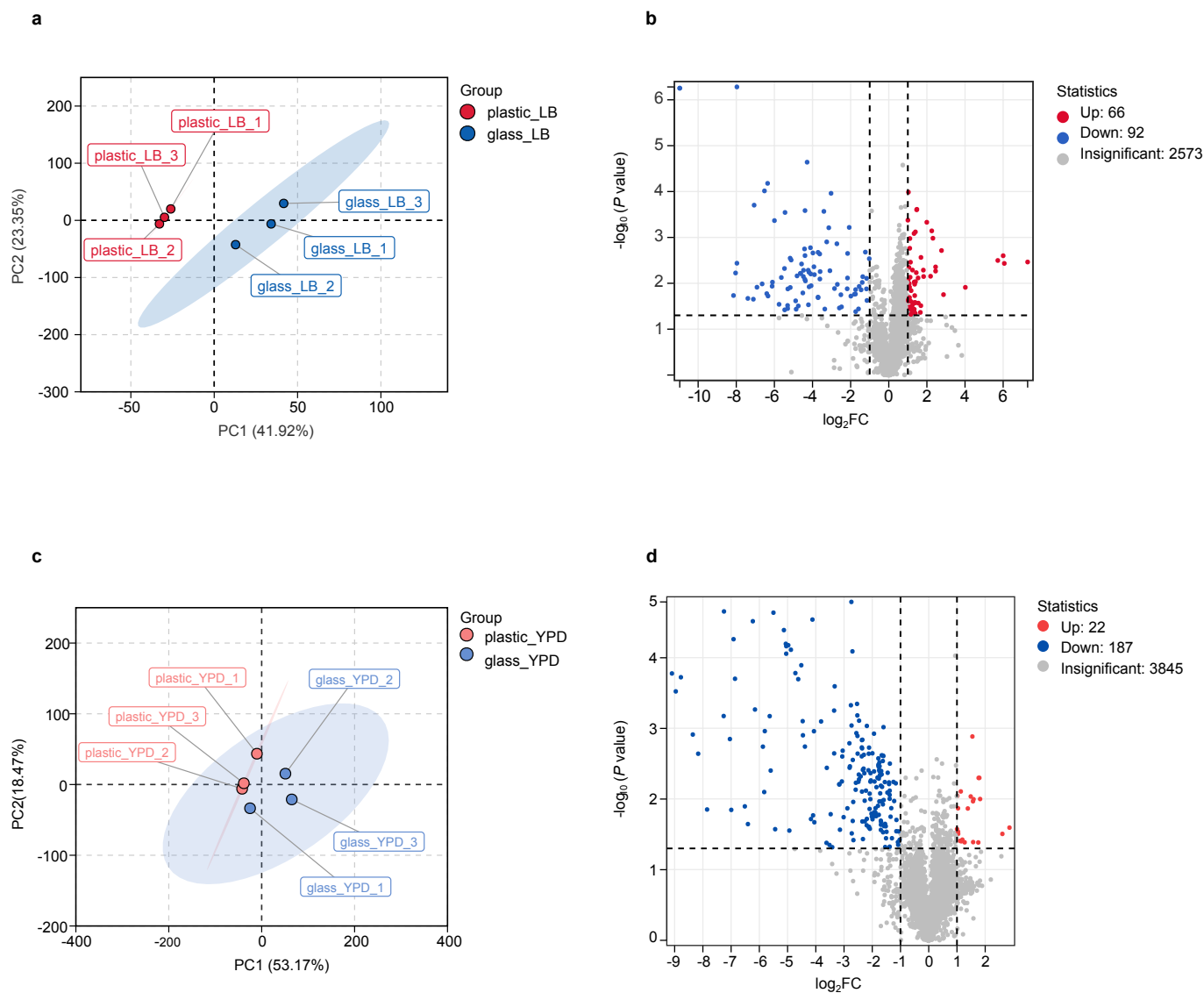
Extended Data Fig.3. Untargeted metabolomic analysis of *Escherichia coli* BL21 reveals limited but directionally consistent metabolic remodeling under plastic culture conditions.

a, PCA illustrating global metabolic patterns of BL21 cultured in polypropylene versus glass containers. **b**, OPLS-DA permutation analysis confirming model validity. **c**, Volcano plot showing differentially significant metabolites identified in BL21. **d**, Bar plots of selected key differential metabolites, highlighting reproducible alterations in lipid-related and stress-associated metabolites. **e**, KEGG pathway enrichment analysis based on all differential metabolites, illustrating pathway-level trends despite the limited number of significantly altered compounds. **f**, GSEA enrichment plots for KEGG pathways derived from metabolite ranking, Biosynthesis of secondary metabolites (map01110) in negative-ion mode.

a**b**

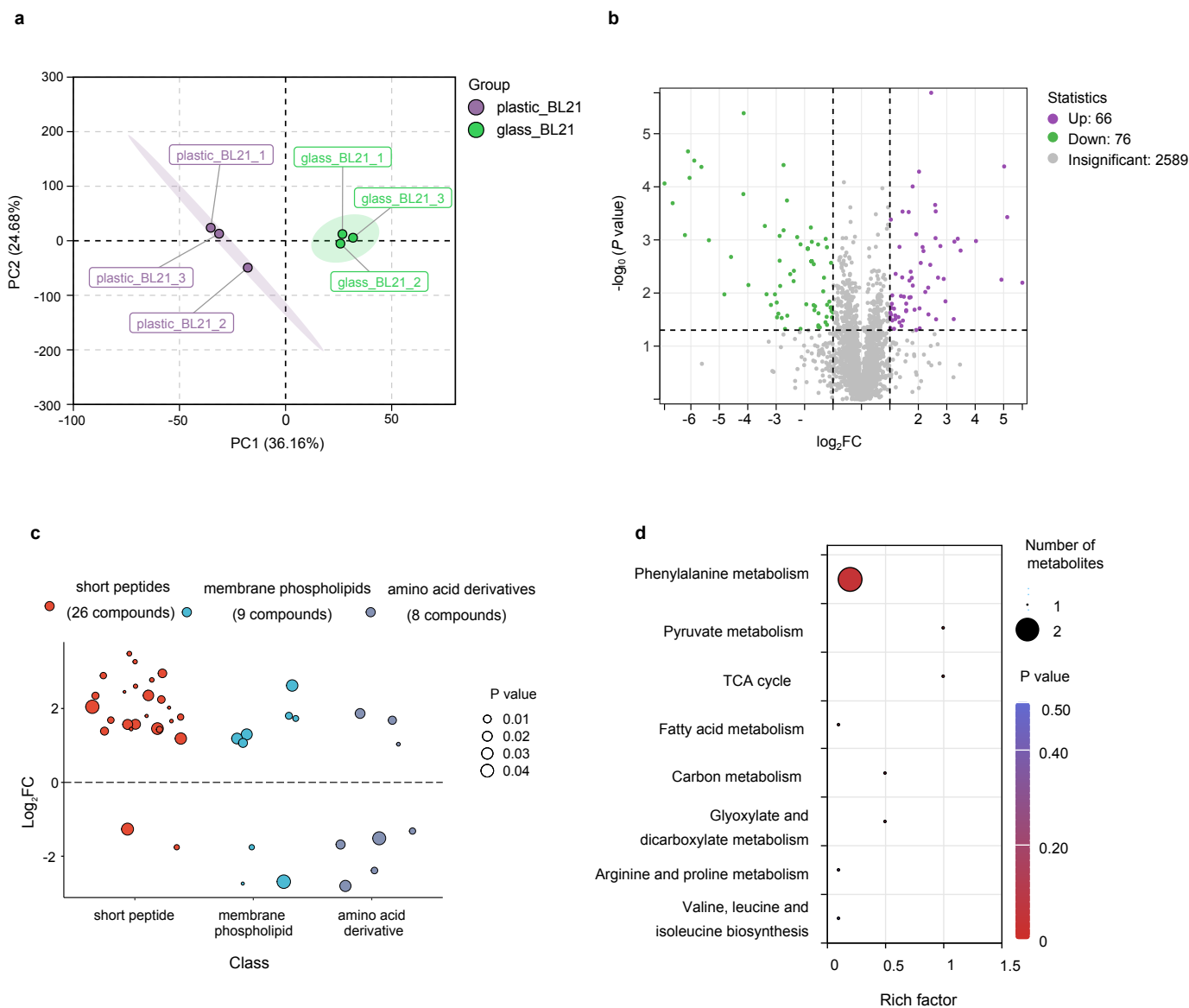
Extended Data Fig.4. Quantification standard curves for ATP and protein content.

a, ATP quantification standard curve used for measurement of ATP levels in GS115 and BL21. **b**, BCA protein quantification standard curve used to measure total protein content in GS115 and BL21.



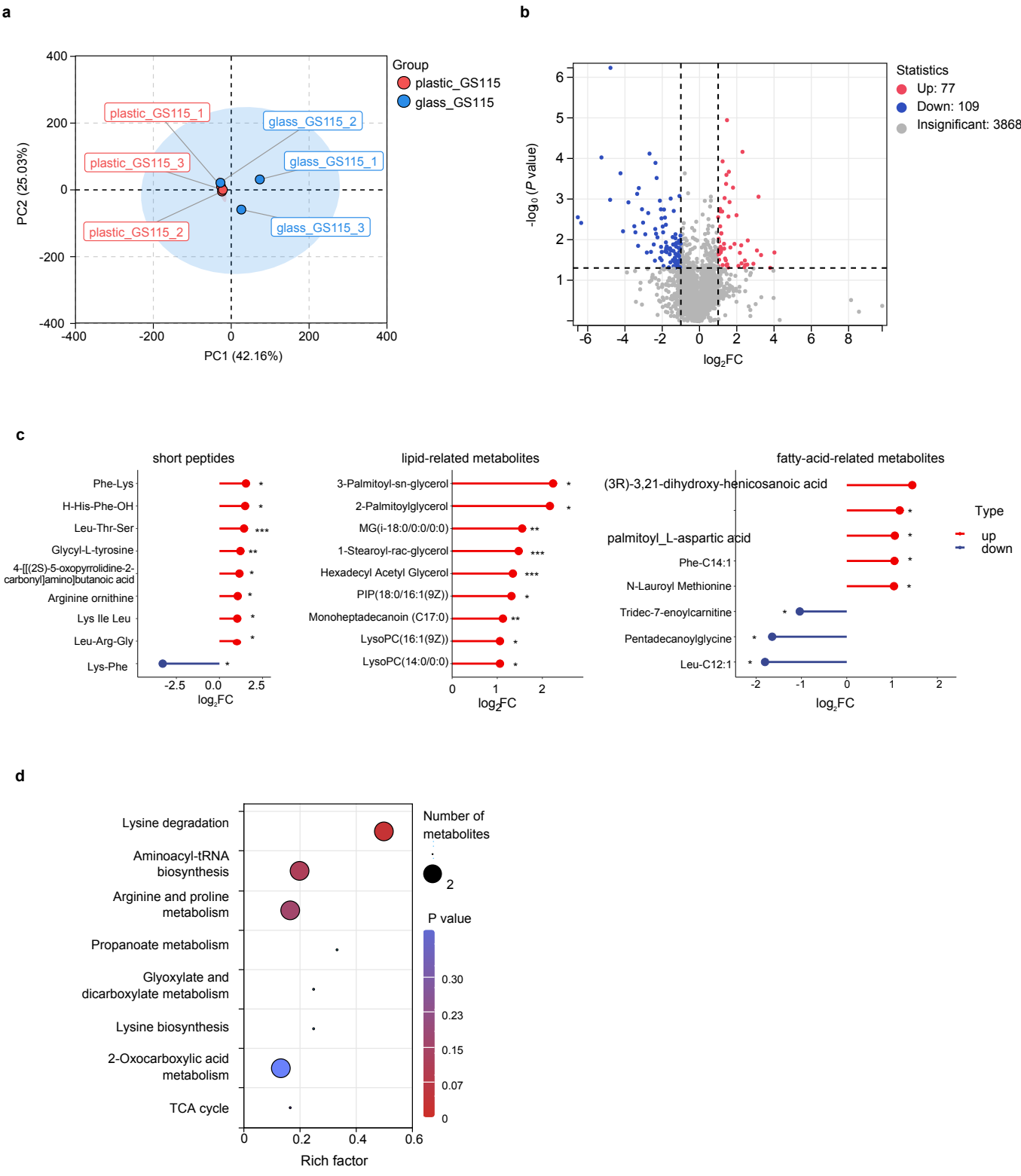
Extended Data Fig. 5. Global chemical profiles of uninoculated LB and YPD media in plastic and glass vessels.

a, PCA score plot of chemical profiles in uninoculated LB medium incubated in plastic or glass vessels. **b**, Volcano plot showing differential features between plastic- and glass-incubated LB medium. **c**, PCA score plot of chemical profiles in uninoculated YPD medium incubated in plastic or glass vessels. **d**, Volcano plot showing differential features between plastic- and glass-incubated YPD medium.



Extended Data Fig. 6. Extracellular metabolomic remodeling of BL21 in plastic and glass culture vessels.

a, PCA score plot of extracellular metabolomic profiles from BL21 culture supernatants under plastic and glass conditions. **b**, Volcano plot of differential extracellular metabolites between the BL21-plastic and BL21-glass groups. **c**, Distribution of selected differential metabolite classes in BL21 culture supernatants. **d**, Exploratory KEGG pathway enrichment of differential extracellular metabolites in BL21.



Extended Data Fig. 7. Extracellular metabolomic remodeling of GS115 in plastic and glass culture vessels.

a, PCA score plot of extracellular metabolomic profiles from GS115 culture supernatants under plastic and glass conditions. **b**, Volcano plot of differential extracellular metabolites between the GS115-plastic and GS115-glass groups. **c**, Representative differential extracellular metabolites, including short peptides, lipid-related metabolites and fatty-acid-related metabolites. **d**, Exploratory KEGG pathway enrichment of differential extracellular metabolites in GS115.