

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization

International Bureau

(43) International Publication Date
26 June 2025 (26.06.2025)



(10) International Publication Number
WO 2025/133298 A2

(51) International Patent Classification:

C08J 11/14 (2006.01) C07D 223/10 (2006.01)
C07D 201/12 (2006.01) C08G 69/16 (2006.01)

(21) International Application Number:

PCT/EP2024/088180

(22) International Filing Date:

20 December 2024 (20.12.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

23219096.7 21 December 2023 (21.12.2023) EP

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,
KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,

MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,
TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: HIGHLY WATER-EFFICIENT PROCESS FOR PREPARING PURIFIED EPSILON-CAPROLACTAM FROM
POLYAMIDE 6

(57) Abstract: A process for preparing purified ϵ -caprolactam from polyamide 6 comprised in a solid material M, the process comprising preparing an aqueous liquid stream S_R comprising ϵ -caprolactam, comprising providing the solid material M; preparing a liquid stream S_W exhibiting a water mass flow μ_W , the stream S_W comprising a recycle stream S_{WR} exhibiting a water mass flow μ_{WR} and a makeup stream S_{WF} exhibiting a water mass flow μ_{WF} ; preparing a depolymerization mixture based on the solid material M and the stream S_W ; subjecting in a chemical reaction unit U_R the depolymerization mixture to depolymerization conditions, obtaining a reaction mixture M_R comprising ϵ -caprolactam; removing from U_R the stream S_R exhibiting a water mass flow μ_R ; subjecting the stream S_R to depressurization in an evaporation unit U_E , obtaining from U_E a stream S_L comprising ϵ -caprolactam exhibiting a water mass flow μ_L , and at least one vapor stream S_{EV} exhibiting a total water mass flow μ_{EV} ; reprocessing the stream S_L in a heat-consuming purification and recycle unit U_{PR} , comprising subjecting the stream S_L to ϵ -caprolactam purification, obtaining a stream S_{CPL} comprising purified ϵ -caprolactam and at least one stream S_{WS} exhibiting a total water mass flow μ_{WS} ; providing at least part of the heat consumed in U_{PR} by the at least one vapor stream S_{EV} , obtaining at least one at least partially condensed stream S_{EL} exhibiting a total water mass flow μ_{EL} ; recycling the at least one stream S_{WS} and the at least one stream S_{EL} as recycle stream S_{WR} , wherein $\mu_{WS} + \mu_{EL} = \mu_{WR}$; and wherein μ_{EV} / μ_L is in the range of from 0.50 to 0.9 and μ_{WR} / μ_W is in the range of from 0.02 to 0.3.



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