Electronic supplementary information

Enrichment of trace rare earth elements from leaching liquor of ion-absorption minerals by solid complex centrifugal separation process

X–ray Crystallographic Experiment

Suitable single-crystal of POAA, POPA and POBA were used for the X-ray crystallographic analysis on a Bruker D8 Quest diffractometer with graphite-monochromated Mo-Kα (λ = 0.71073 Å) radiation at a temperature of 296K. The frames were integrated with the Bruker SAINT software package using a narrow-frame algorithm. Data were corrected for absorption effects using the Multi-Scan method (SADABS) The crystal structures were solved by means of Direct Methods and refined employing full-matrix least squares on F^2 using the Bruker SHELXTL Software Package.[1,2] All non-hydrogen atoms were refined anisotropically and hydrogen atoms were generated theoretically onto the specific atoms and refined isotropically with fixed thermal factors. The crystal data and structure refinement details for these three compounds are given in Table S1. CCDC 1587654(POAA), 1587655(POPA) and 1587656 (POBA) contain the supplementary crystallographic data for this paper. These data are provided free of charge by the Cambridge Crystallographic Data Centre.

1. G. M. Sheldrick, Crystal structure refinement with *SHELXL*, *Acta Cryst.* 2015, C71, 3-8
2. G.M. Sheldrick, *SHELEXTL*-2014, Bruker AXS Inc.: Madison, WI.

Table S1. Crystal Data and Structure Refinement for Complexes POAA, POPA and POBA

	POAA	POPA	POBA
Formula	$C_{16}H_{24}O_3$	$C_{17}H_{26}O_3$	$C_{36}H_{56}O_6$
Molecular wt.	264.35	278.38	584.80
Cryst. syst	Triclinic	Monoclinic	Monoclinic
Space group	P $\bar{1}$	$P2_1/c$	$P2_1/c$
a (Å)	6.0145(3)	15.6175(13)	12.9802(6)
b (Å)	8.0625(5)	8.4961(7)	8.6558(4)
c (Å)	16.0814(9)	12.670(1)	32.2944(13)
α (°)	94.613(2)	90	90
β (°)	94.613(2)	96.193(2)	94.115(1)
γ (°)	100.073(2)	90	90
V (Å ^{3})	759.50(7)	1671.3(2)	3619.1(3)
Z	2	4	4
D_c/g cm^{-3}	1.156	1.106	1.073
μ/mm^{-1}	0.078	0.074	0.071
F(000)	288	608	1280
Tot. Data	6630	13389	38007
Uniq. Data	2662	2948	6404
R_{int}	0.028	0.061	0.053
GOF	1.04	0.99	1.01
$R_1{}^a$ [$I>2\sigma(I)$]	0.0484	0.0614	0.0761
$wR_2{}^b$(all data)	0.1334	0.1374	0.2222

$^aR_1 = \Sigma||F_0|-|F_c||/\Sigma|F_0|$; $^bwR_2 = \Sigma[w(F_0^2-F_c^2)^2]/\Sigma[w(F_0^2)^2]^{1/2}$

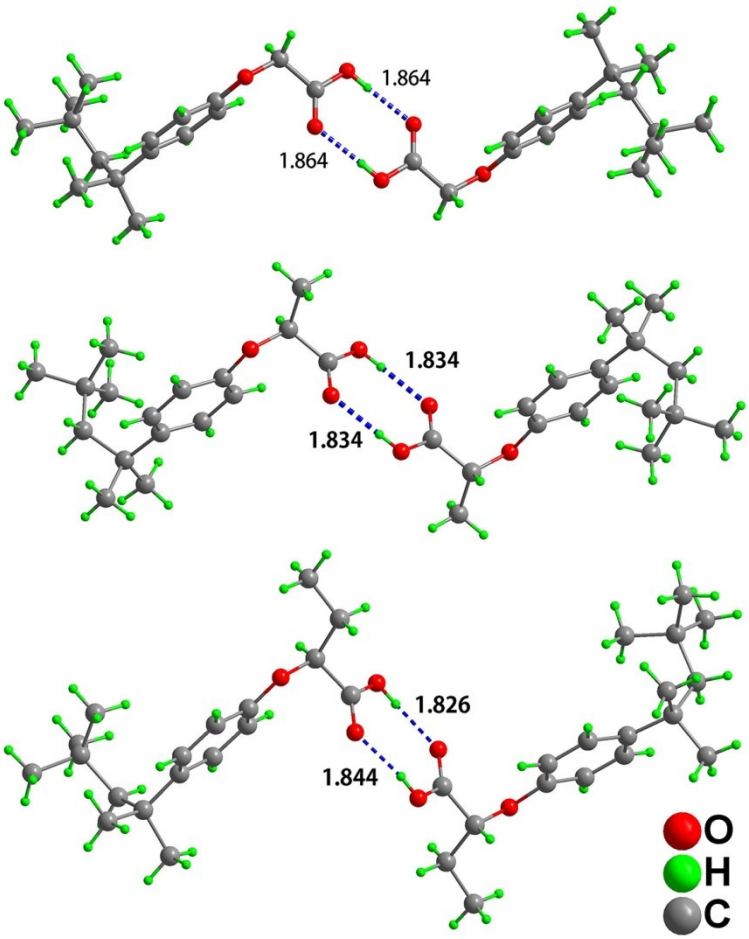

Fig. S1 Dimer molecule structures of POAA, POPA and POBA connected by hydrogen interactions (O–H···O, O-H: 0.820 Å, H···O: Blue dotted lines)