Table S1: Chemical compositions of SW and GW measured by the ion chromatography at the Geological Survey of Japan, AIST.

sample	Na^+ ($mg \cdot L^{-1}$)	K^+ ($mg \cdot L^{-1}$)	Mg^{2+} ($mg \cdot L^{-1}$)	Ca^{2+} ($mg \cdot L^{-1}$)	Cl^- ($mg \cdot L^{-1}$)	SO_4^{2-} ($mg \cdot L^{-1}$)
SW	6378	224	738	245	11216	1582
GW	9.5	5.3	6.6	17.1	8.9	0.9

Table S2: ^{14}C concentration and $\delta^{13}C$ value of $NaHCO_3$-unfilterd, $NaHCO_3$-PES and $NaHCO_3$-GF. Because the changes in ^{14}C concentration are small, they are intentionally listed to two decimal places.

sample	^{14}C (pMC)	$\delta^{13}C$ (‰)
$NaHCO_3$-unfiltered	1.95 ± 0.19	−5.13 ± 0.02
$NaHCO_3$-unfiltered	1.95 ± 0.19	−5.14 ± 0.01
$NaHCO_3$-PES	2.04 ± 0.19	−5.22 ± 0.02
$NaHCO_3$-GF	1.94 ± 0.19	−5.26 ± 0.02
$NaHCO_3$-GF	1.92 ± 0.19	−5.16 ± 0.02

Table S3: DIC concentration, ^{14}C concentration, and $\delta^{13}C$ values for SW and GW. NA: not analyzed because of experimental error of CO_2 extraction. *: not use for discussion.

sample	DIC ($mg \cdot L^{-1}$)	^{14}C (pMC, upper) / $\delta^{13}C$ (‰, lower)			
	Initial	*initial*	*14 days*	*28 days*	*126/285 days*
SW-Control	43.7	41.2 ± 0.3 −4.04 ± 0.02	64.4 ± 0.4 −11.51 ± 0.01	77.2 ± 0.5 −15.94 ± 0.02	91.2 ± 0.4 −19.80 ± 0.00
SW-BAC	43.2	42.2 ± 0.3 −3.97 ± 0.02	42.1 ± 0.3 −4.24 ± 0.02	46.4 ± 0.4 −5.45 ± 0.01	57.4 ± 0.2 −9.11 ± 0.01
SW-PTFE	43.6	41.9 ± 0.3 −4.05 ± 0.01	59.2 ± 0.4 −9.14 ± 0.01	61.8 ± 0.4 −10.43 ± 0.01	88.3 ± 0.3 −18.76 ± 0.02
SW-PES	43.8	41.4 ± 0.3 −3.72 ± 0.01	NA NA	64.9 ± 0.4 −10.88 ± 0.01	70.6 ± 0.3 −14.85 ± 0.02
SW-PTFE+BAC	43.2	41.5 ± 0.3 −4.00 ± 0.02	42.1 ± 0.3 −3.63 ± 0.02	41.9 ± 0.3 −4.25 ± 0.01	41.9 ± 0.2 −3.78 ± 0.01
SW-PES+BAC	43.1	41.4 ± 0.3 −3.87 ± 0.01	41.9 ± 0.3 −3.76 ± 0.01	42.1 ± 0.3 −3.88 ± 0.02	41.6 ± 0.2 −3.68 ± 0.02
GW-Control	59.1	10.2 ± 0.1 −5.98 ± 0.01	19.2 ± 0.2 −5.93 ± 0.02	33.8 ± 0.4 −4.61 ± 0.01	46.1 ± 0.3 −5.61 ± 0.01
GW-BAC	54.2	10.8 ± 0.1 −6.00 ± 0.02	10.6 ± 0.1 −5.96 ± 0.01	10.4 ± 0.1 −5.96 ± 0.01	10.9 ± 0.1 −5.96 ± 0.01
GW-PTFE	53.7	10.5 ± 0.1 −6.00 ± 0.02	13.7 ± 0.2 −6.74 ± 0.01	14.4 ± 0.2 −6.94 ± 0.01	NA NA
GW-PES	55.7	10.7 ± 0.1 −5.98 ± 0.02	13.7 ± 0.2 −6.70 ± 0.01	13.3 ± 0.2 −6.65 ± 0.01	14.3 ± 0.1 −6.64 ± 0.01
GW-PTFE+BAC	54.7	10.5 ± 0.1 −5.99 ± 0.02	11.0 ± 0.1 −5.98 ± 0.01	10.2 ± 0.1 −5.96 ± 0.01	10.4 ± 0.1 −5.97 ± 0.01
GW-PES+BAC	55.1	10.9 ± 0.1 −5.98 ± 0.01	10.7 ± 0.1 −5.96 ± 0.01	10.6 ± 0.1 −5.96 ± 0.01	10.6 ± 0.1 −5.96 ± 0.01