

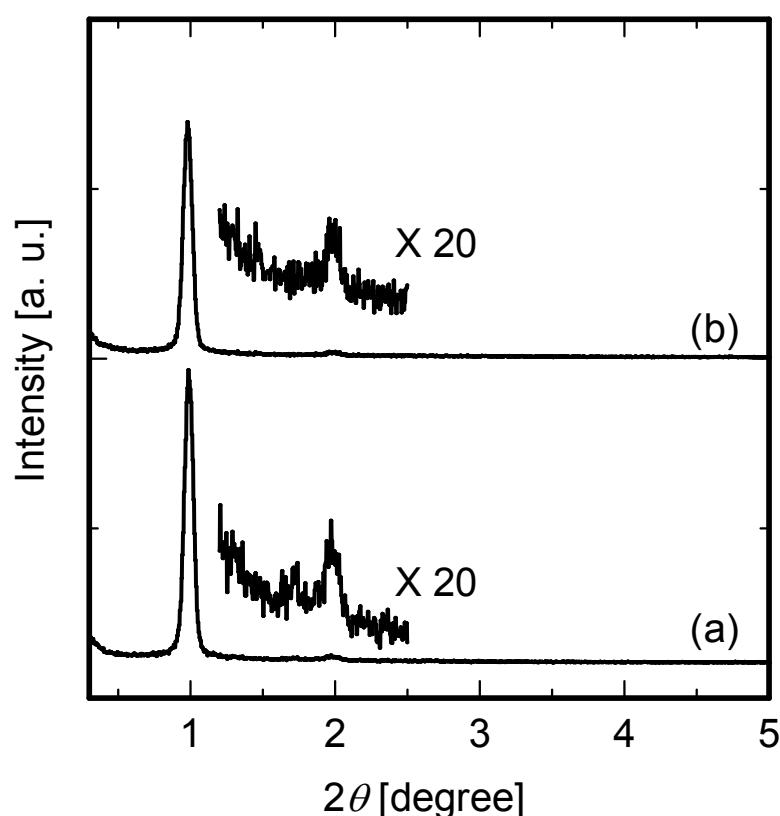
## Supplementary information

### Base-resistant absorbents prepared using diamino group-grafted mesoporous silica uniformly coated with zirconia

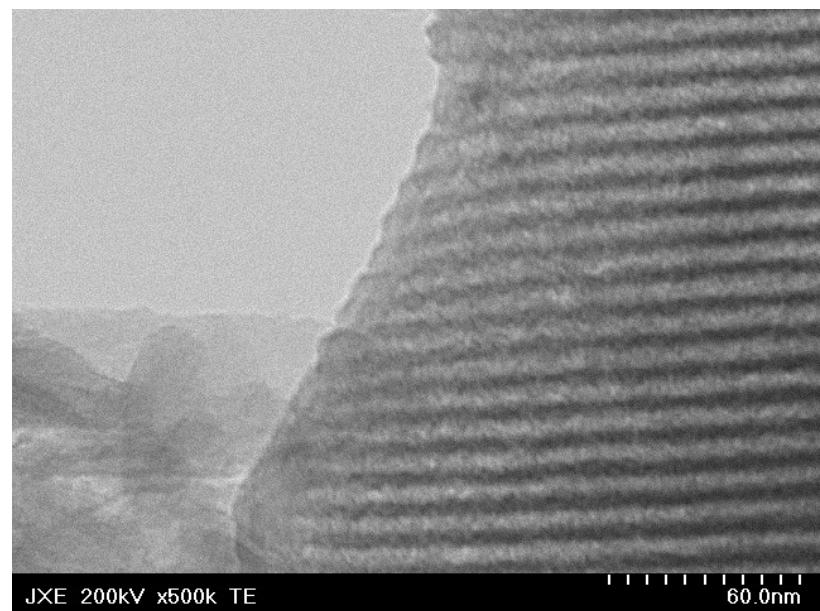
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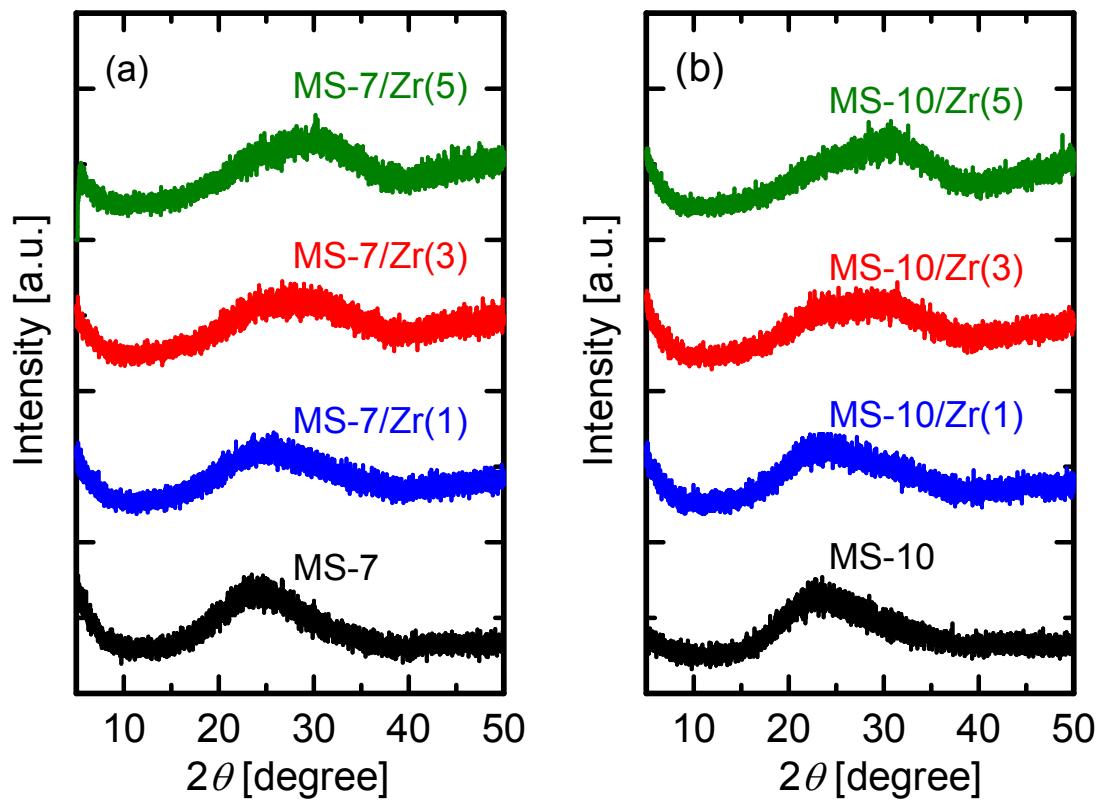
<sup>b</sup>*Central Technical Research Laboratory, JXTG Nippon Oil & Energy Co., Chidori-cho, Naka-ku, Yokohama-shi, Kanagawa 231-0815, Japan.*



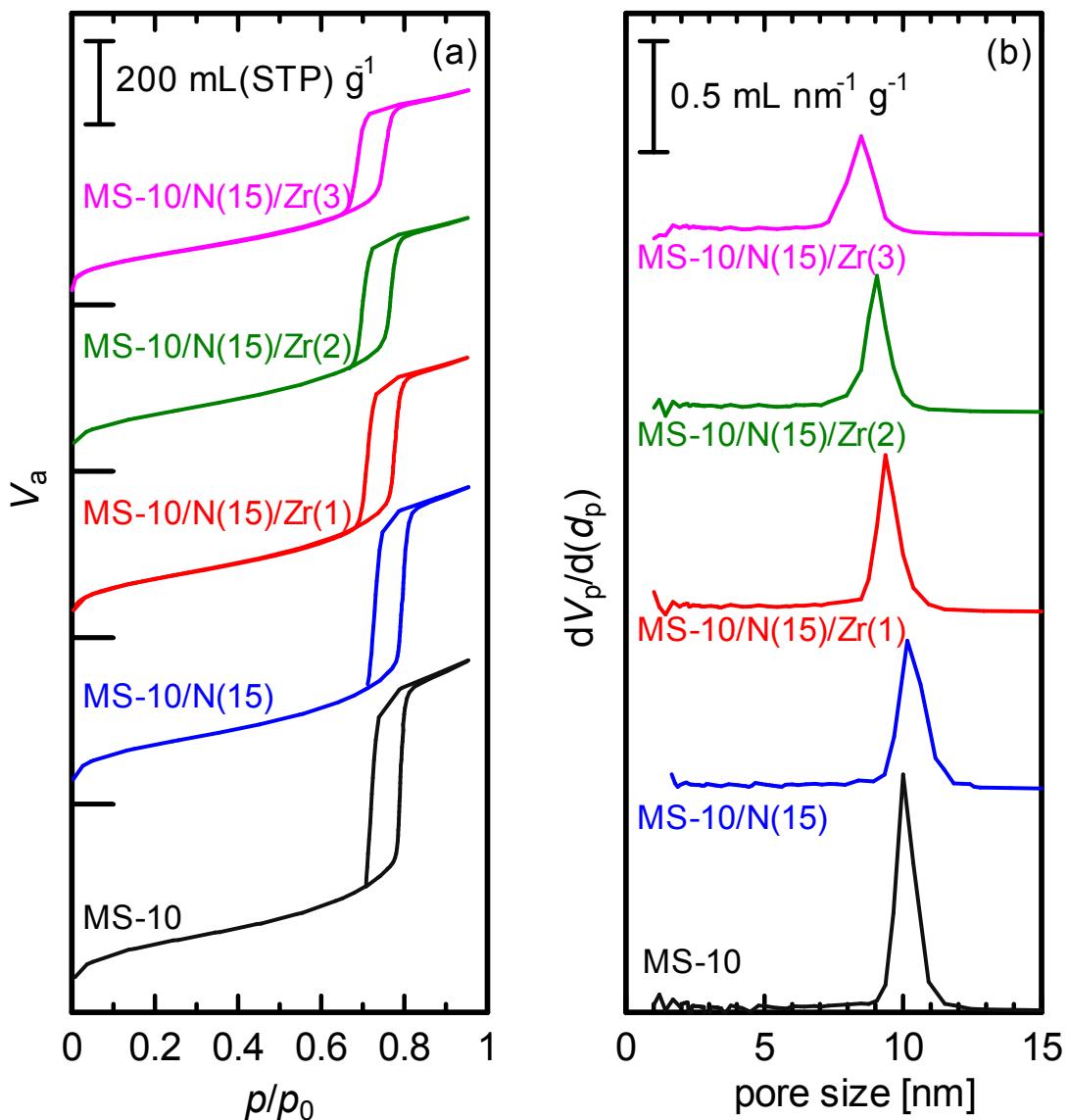
**Fig. S1** SAXS patterns of (a) MS-7 and (b) MS-7/Zr(1).



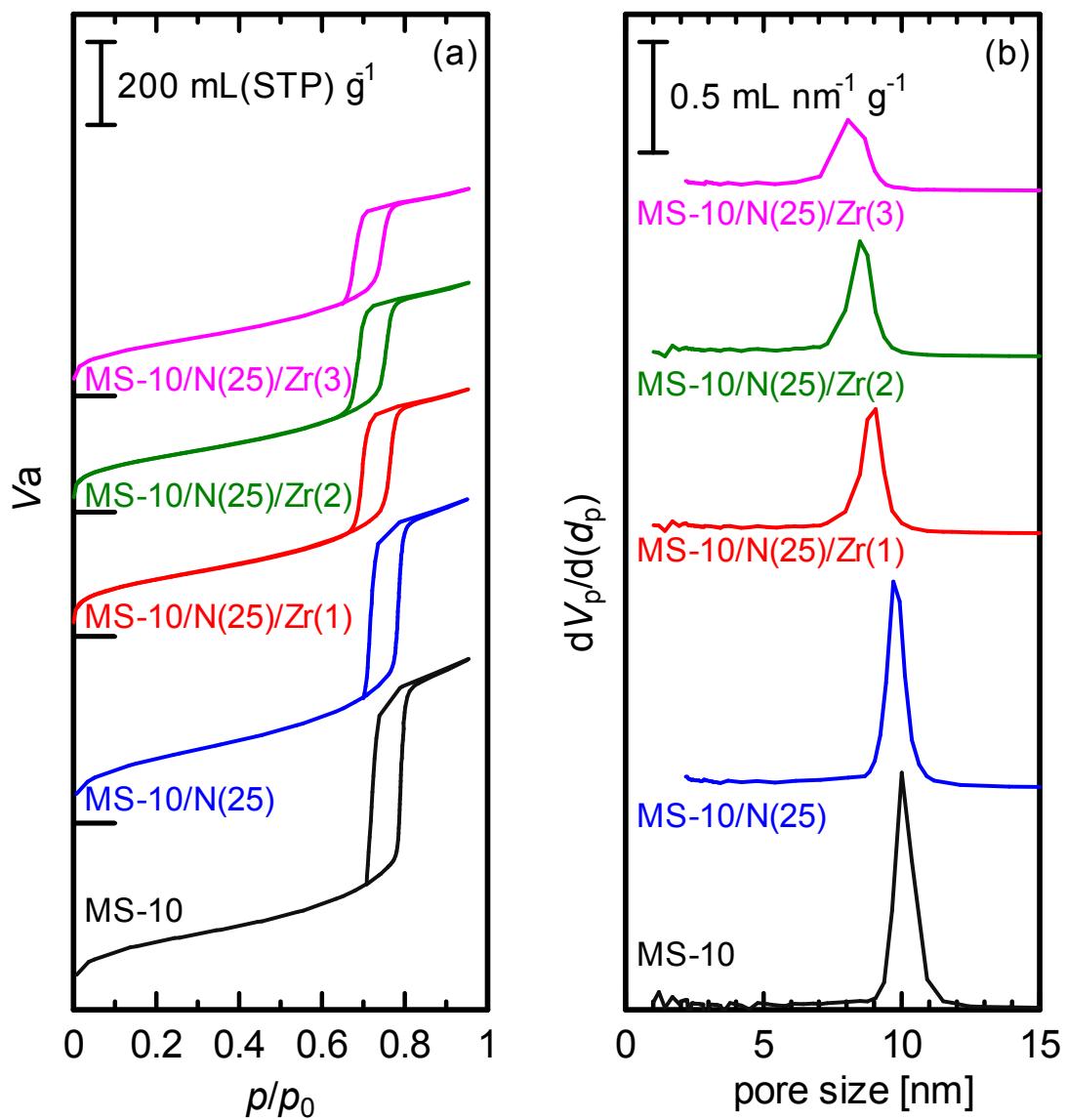
**Fig. S2** STEM image of MS-10 that had been coated with zirconia layers five times.



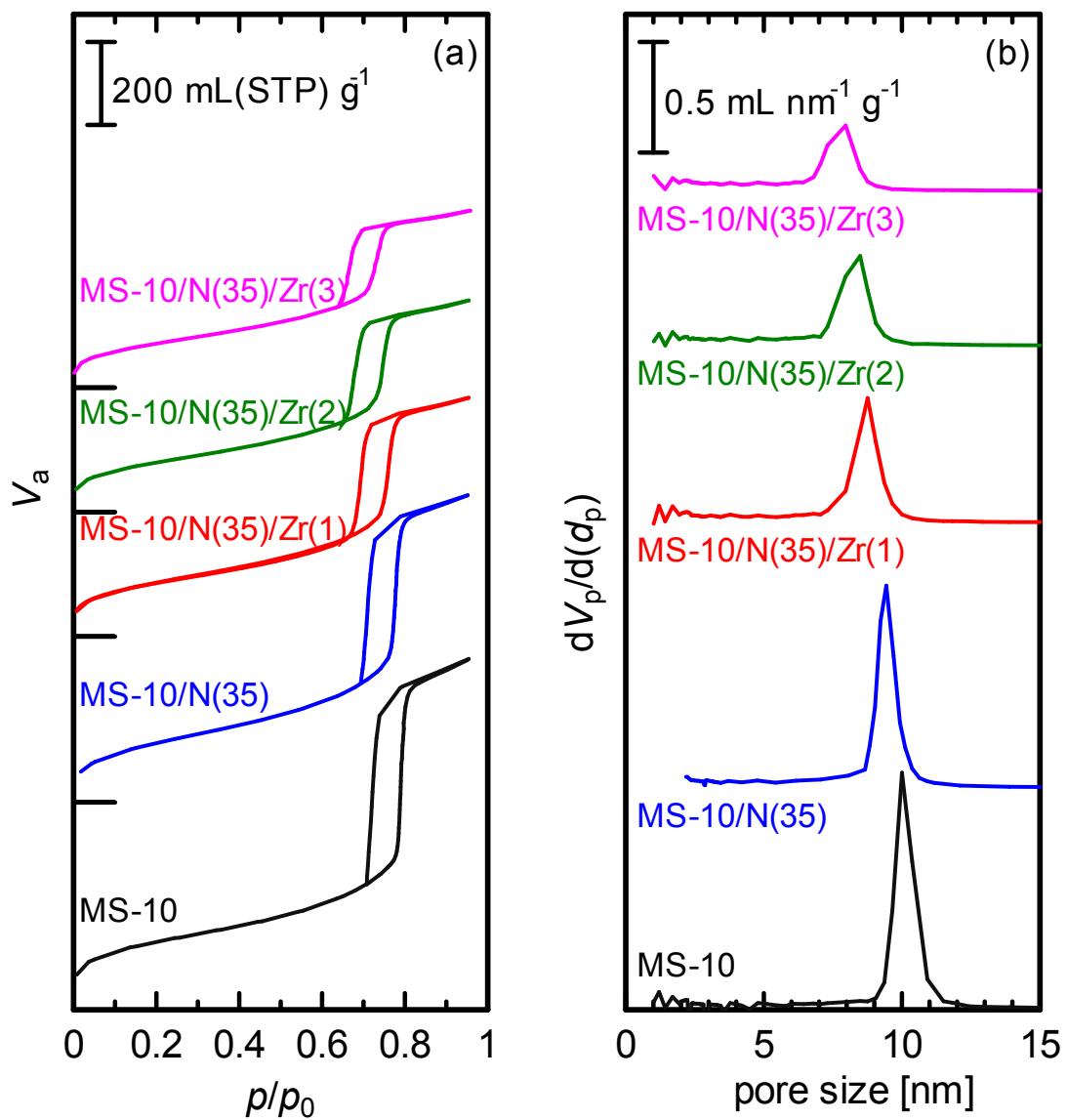
**Fig. S3** XRD patterns of (a) MS-7 and (b) MS-10 coated with zirconia layers up to five times.



**Fig. S4** (a) Nitrogen adsorption–desorption isotherms and (b) pore size distribution of diamino group-grafted MS-10 (diaminosilane/silanol = 15%) coated with zirconia layers up to three times.



**Fig. S5** (a) Nitrogen adsorption–desorption isotherms and (b) pore size distribution of diamino group-grafted MS-10 (diaminosilane/silanol = 25%) coated with zirconia layers up to three times.



**Fig. S6** (a) Nitrogen adsorption–desorption isotherms and (b) pore size distribution of diamino group-grafted MS-10 (diaminosilane/silanol = 35%) coated with zirconia layers up to three times.

**Table S1** Porosities and elemental analysis of zirconia-coated MS-7 and MS-10

Sample	Zr/Si (mol/mol)	Specific surface area <sup>a</sup> /m <sup>2</sup> g <sup>-1</sup>	Pore volume <sup>a</sup> /mL g <sup>-1</sup>	Pore size /nm
MS-7	-	1044	1.1	7.0
MS-7/Zr(1)	0.096	857	0.92	6.5
MS-7/Zr(2)	0.16	797	0.87	6.2
MS-7/Zr(3)	0.21	790	0.84	6.0
MS-7/Zr(4)	0.29	764	0.82	5.8
MS-7/Zr(5)	0.31	613	0.68	5.5
MS-10	-	546	1.24	10.5
MS-10/Zr(1)	0.081	528	1.18	10.5
MS-10/Zr(2)	0.14	564	1.21	10.0
MS-10/Zr(3)	0.21	586	1.19	9.5
MS-10/Zr(4)	0.26	549	1.10	8.9
MS-10/Zr(5)	0.32	531	1.10	8.3

<sup>a</sup> per silica weight

**Table S2** Porosities and elemental analysis of diamino group-grafted mesoporous silica coated with zirconia

Sample	Amount of diamino group <sup>a</sup> /mol g <sup>-1</sup>	Zr/Si (mol/mol)	Specific surface area <sup>a</sup> /m <sup>2</sup> g <sup>-1</sup>	Pore volume <sup>a</sup> /mL g <sup>-1</sup>	Pore size /nm
MS-10	-	-	605	1.3	10
MS-10/N(15)	0.12	-	523	1.2	10
MS-10/N(15)/Zr(1)	0.12	0.060	516	1.0	9.4
MS-10/N(15)/Zr(2)	0.12	0.11	494	0.94	9.1
MS-10/N(15)/Zr(3)	0.12	0.15	432	0.80	8.5
MS-10/N(25)	0.34	-	571	1.2	9.7
MS-10/N(25)/Zr(1)	0.34	0.078	501	0.92	9.1
MS-10/N(25)/Zr(2)	0.34	0.11	474	0.86	8.5
MS-10/N(25)/Zr(3)	0.34	0.15	449	0.77	8.1
MS-10/N(35)	0.59	-	531	1.1	9.4
MS-10/N(35)/Zr(1)	0.59	0.055	476	0.89	8.8
MS-10/N(35)/Zr(2)	0.59	0.091	437	0.79	8.5
MS-10/N(35)/Zr(3)	0.59	0.13	387	0.66	8.0

<sup>a</sup> per silica weight