

Electronic Supplementary Information (ESI) for

**Ru cyclooctatetraene precursors for MOCVD**

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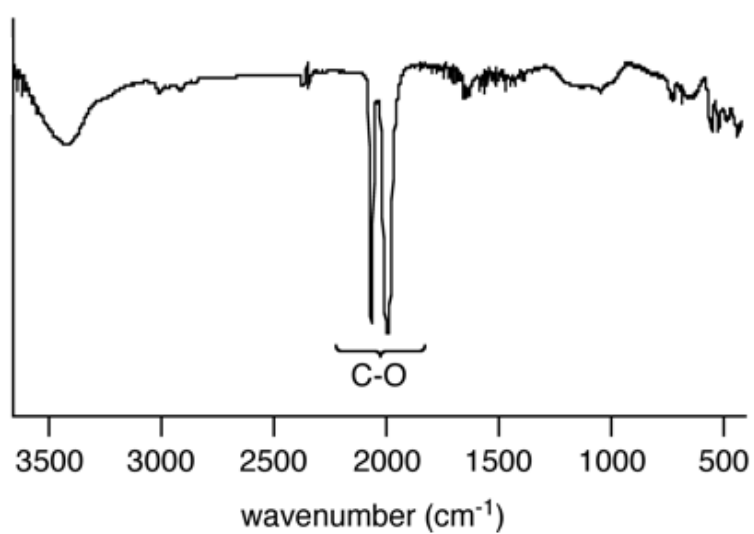
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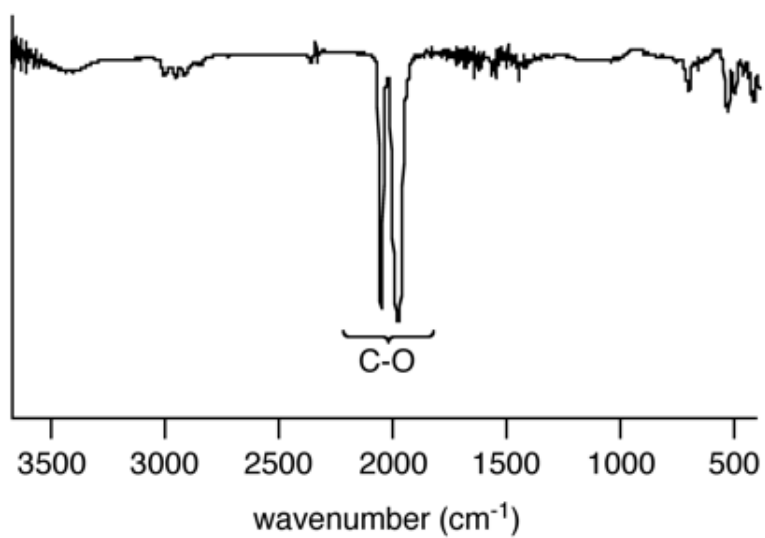
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**Table S1.** A table of contents

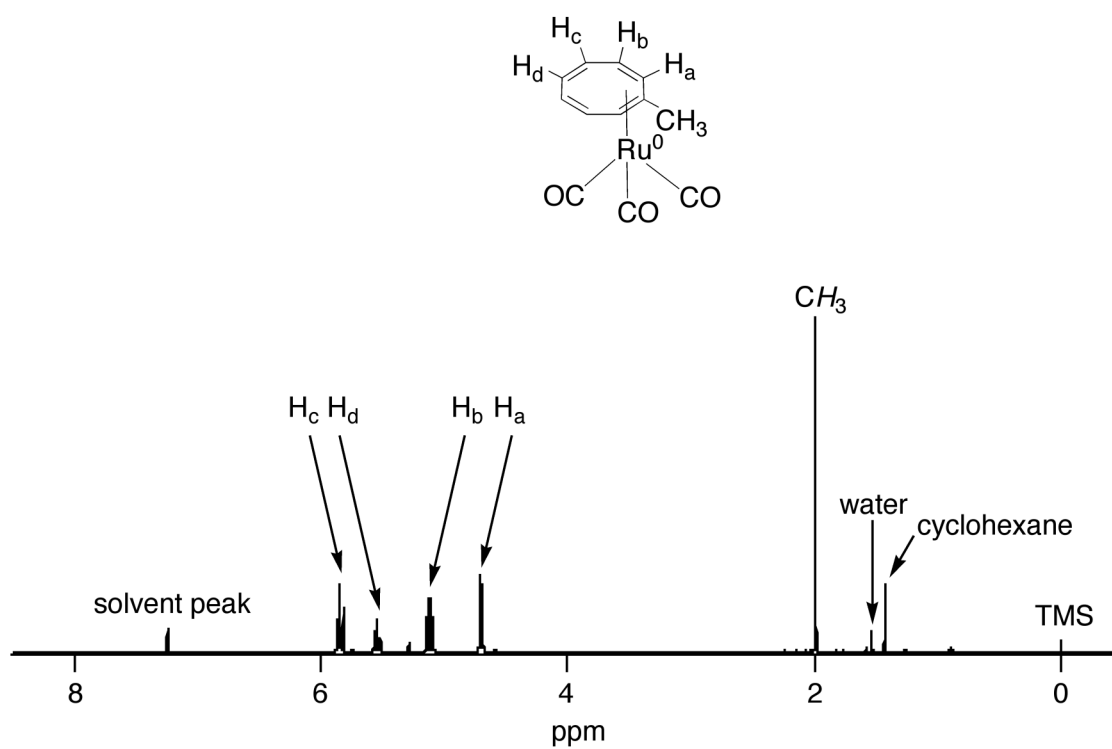
	[Ru <sup>0</sup> (η <sup>4</sup> -COT-H)- (CO) <sub>3</sub> ] ( <b>1</b> )	[Ru <sup>0</sup> (η <sup>4</sup> -COT-Me)- (CO) <sub>3</sub> ] ( <b>2</b> )	[Ru <sup>0</sup> (η <sup>4</sup> -COT-Et)- (CO) <sub>3</sub> ] ( <b>3</b> )
FTIR	previously reported	Fig. S1	Fig. S2
<sup>1</sup> H NMR	previously reported	Fig. S3	Fig. S4
X-ray	previously reported	Fig. 4	–
TG-DTA	Fig. S5	Fig. S6	Fig. S7
melting point	Table 1	Table 1	Table 1
decomposition temperature	Table 1	Table 1	Table 1
vapour pressure	Table 1	Table 1	Table 1
SEM	Fig. S8	Fig. 6	Fig. S9
AFM	Fig. S10	Fig. 7	Fig. S11
XRD	–	Fig. S12	–
XPS	Fig. S13	Fig. 8	Fig. S14
SEM	Fig. S15	Fig. 9	Fig. S16



**Fig. S1** IR spectrum of **2** as a KBr disk.



**Fig. S2** IR spectrum of **3** as a KBr disk.



**Fig. S3**  $^1\text{H}$  NMR spectrum of **2** in  $\text{CDCl}_3$ .

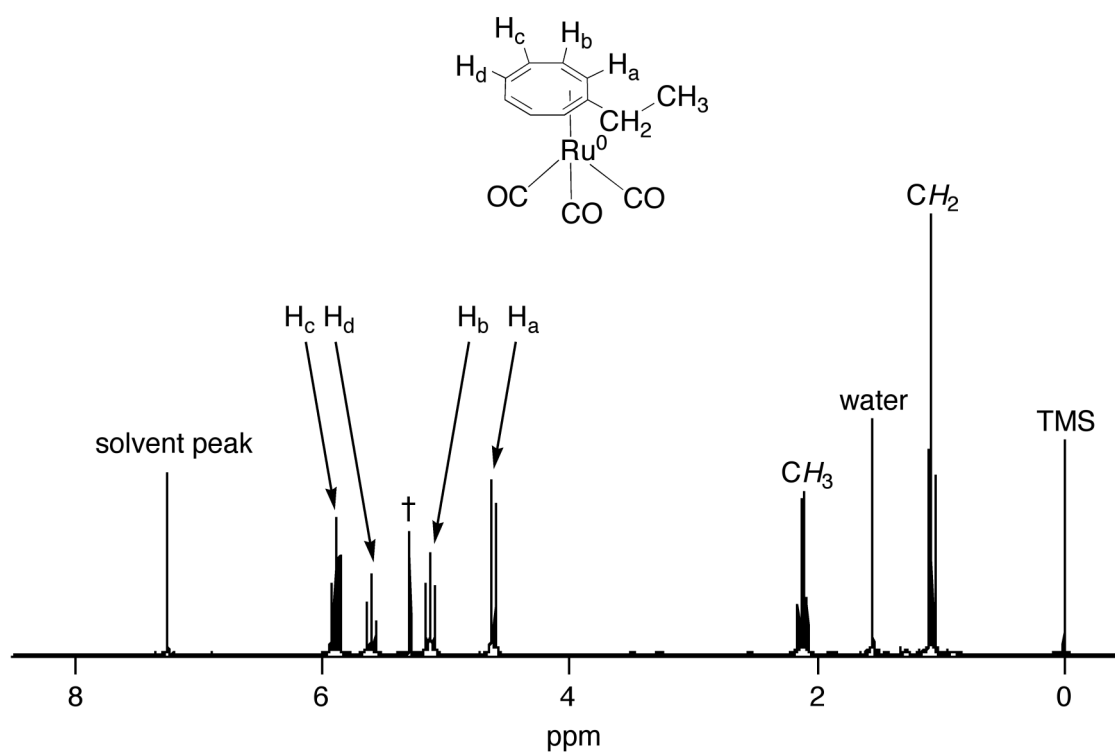
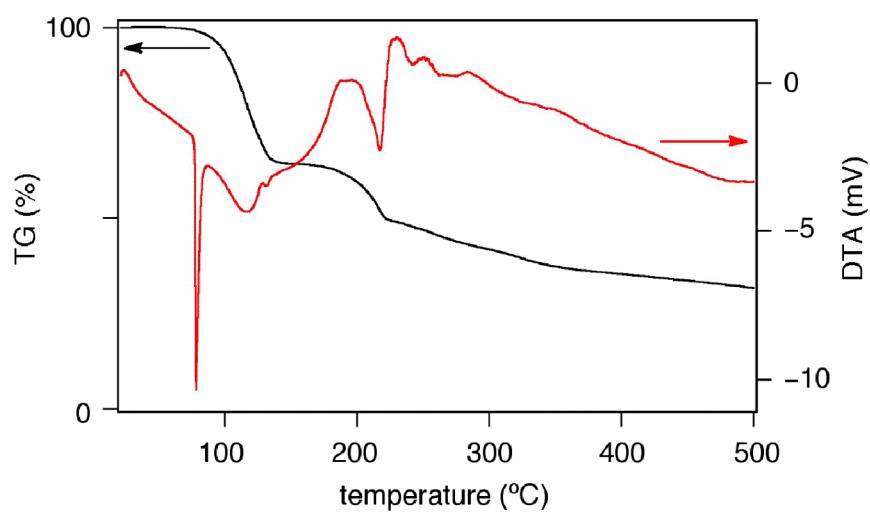
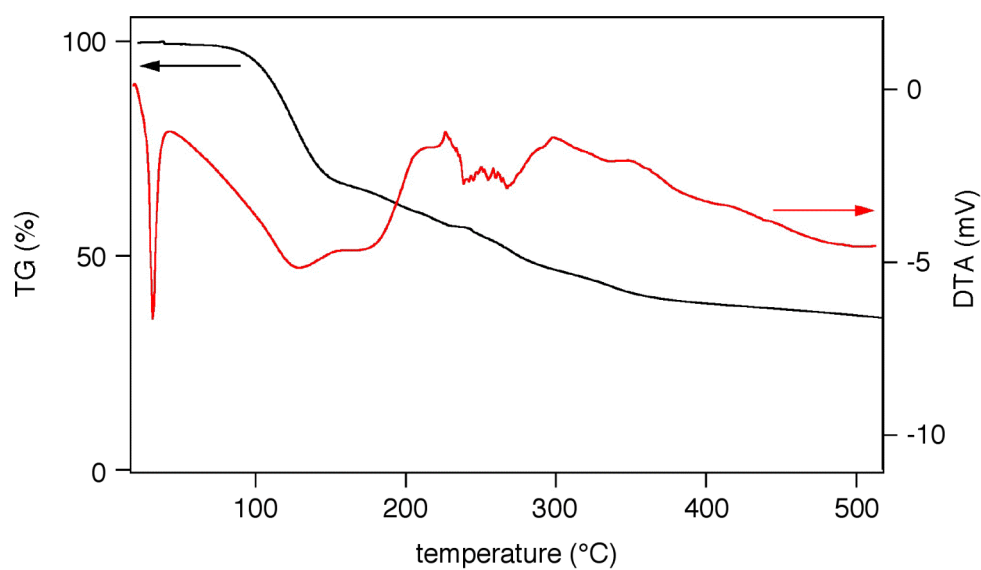


Fig. S4 <sup>1</sup>H NMR spectrum of **3** in CDCl<sub>3</sub>. †: Impurity, **1**.

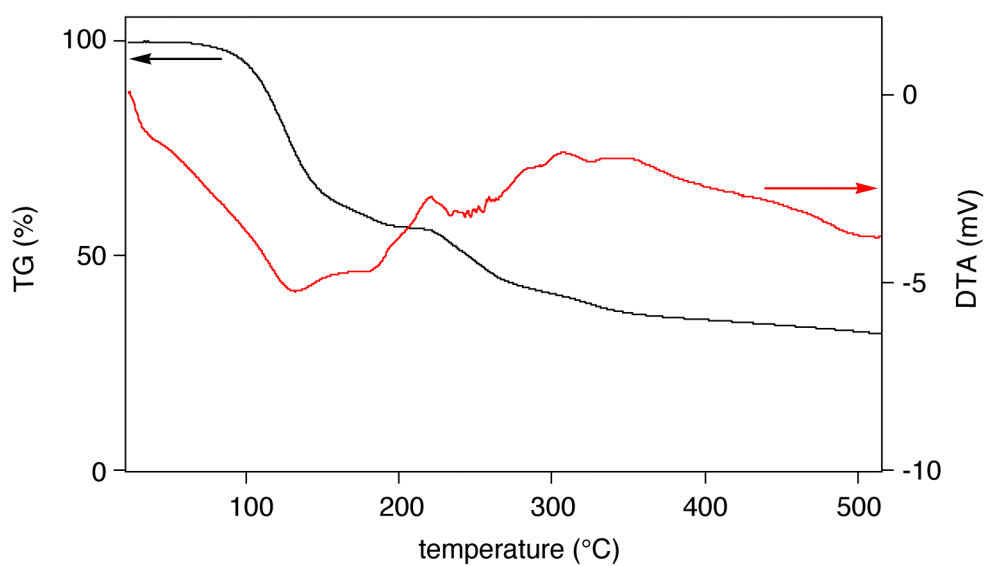


**Fig. S5** TG-DTA analysis of **1** (flow gas: N<sub>2</sub>, flow rate: 100 mL min<sup>-1</sup>, heating rate: 5 °C min<sup>-1</sup>).

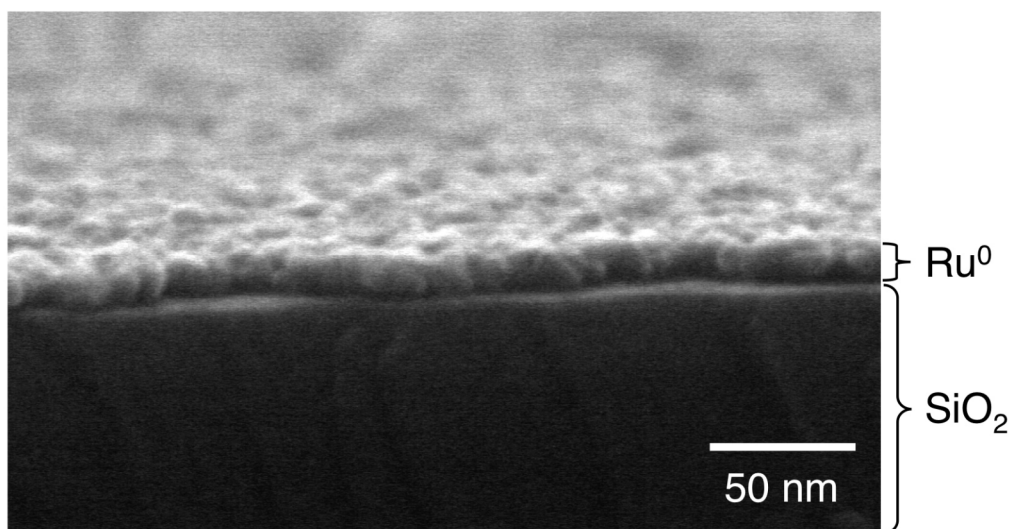




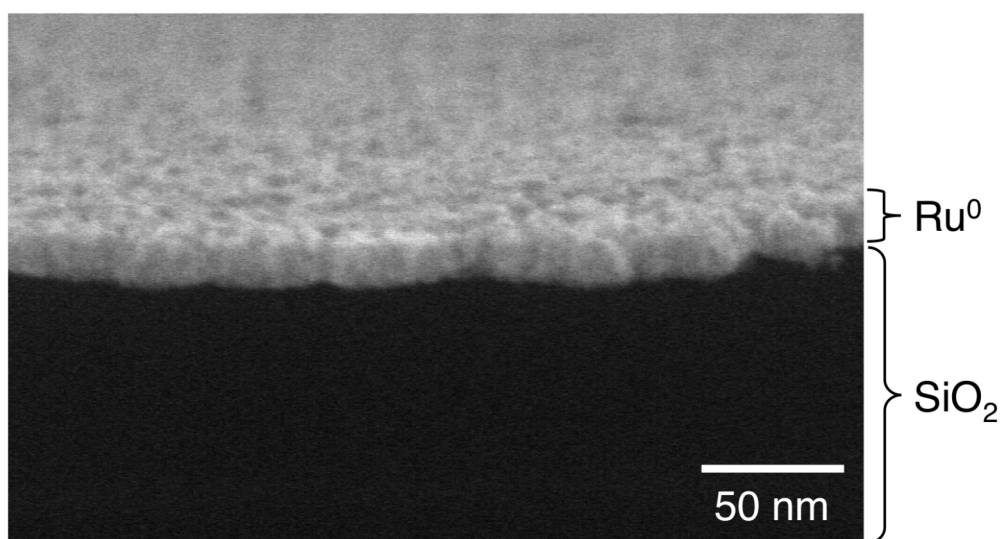
**Fig. S6** TG-DTA analysis of **2** (flow gas: N<sub>2</sub>, flow rate: 100 mL min<sup>-1</sup>, heating rate: 5 °C min<sup>-1</sup>).



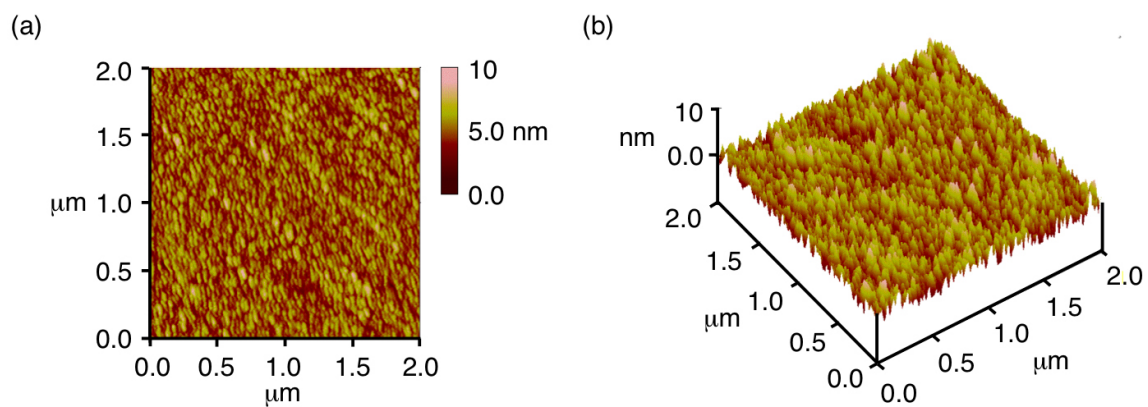
**Fig. S7** TG-DTA analysis of **3** (flow gas: N<sub>2</sub>, flow rate: 100 mL min<sup>-1</sup>, heating rate: 5 °C min<sup>-1</sup>).



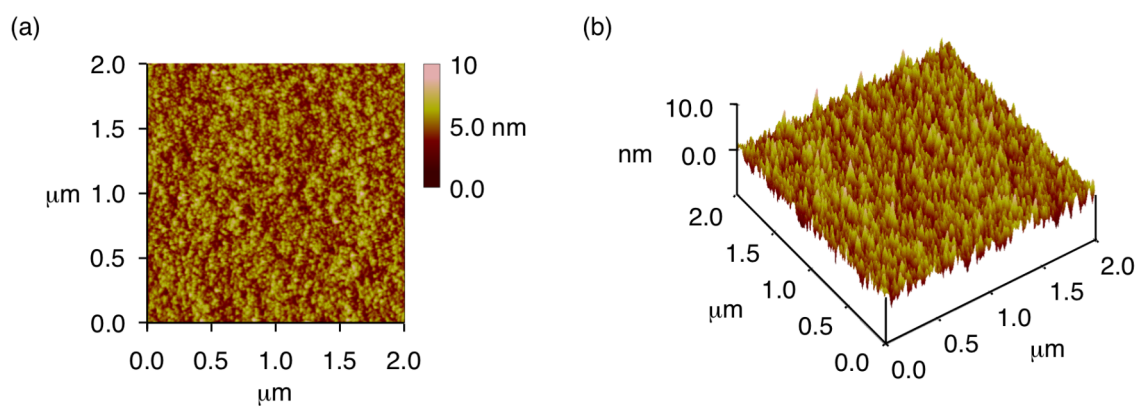
**Fig. S8** A SEM image of a Ru film deposited from **1** at 165 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm).



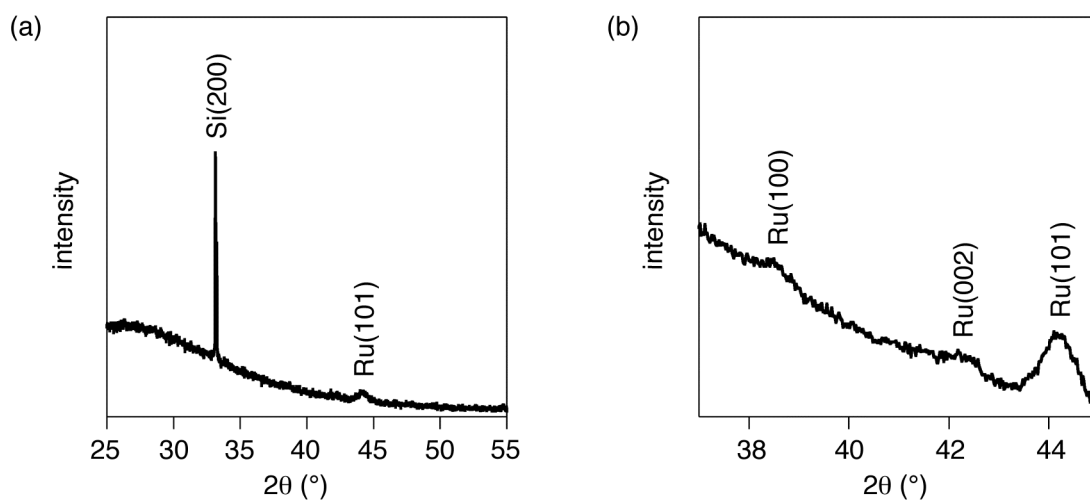
**Fig. S9** A SEM image of a Ru film deposited from **3** at 165 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm).



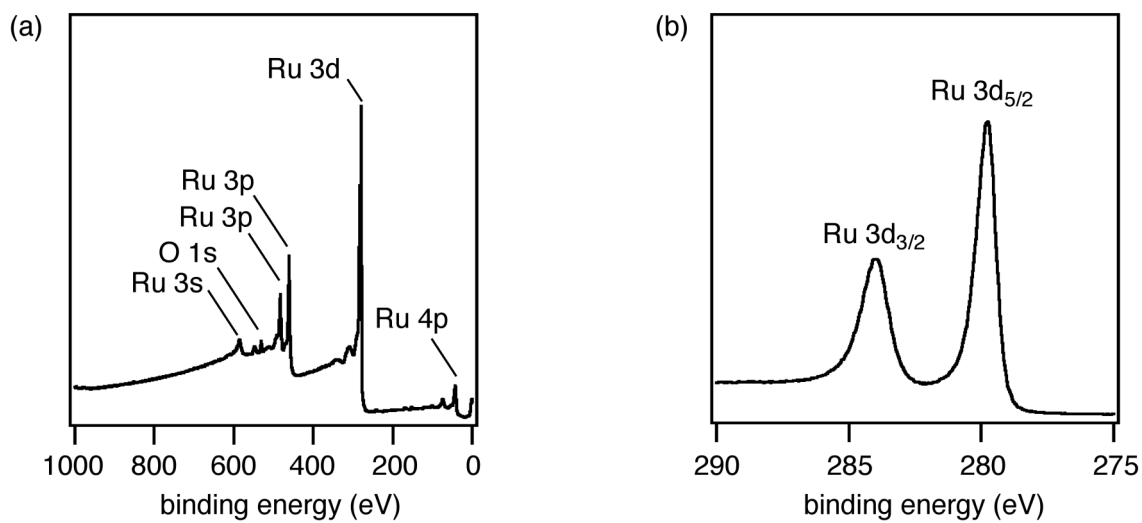
**Fig. S10** An AFM image of a 17 nm thick Ru film deposited from **1** at 165 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm). (a) Two- and (b) three-dimensional views.



**Fig. S11** An AFM image of a 49 nm thick Ru film deposited from **3** at 175 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm). (a) Two- and (b) three-dimensional views.

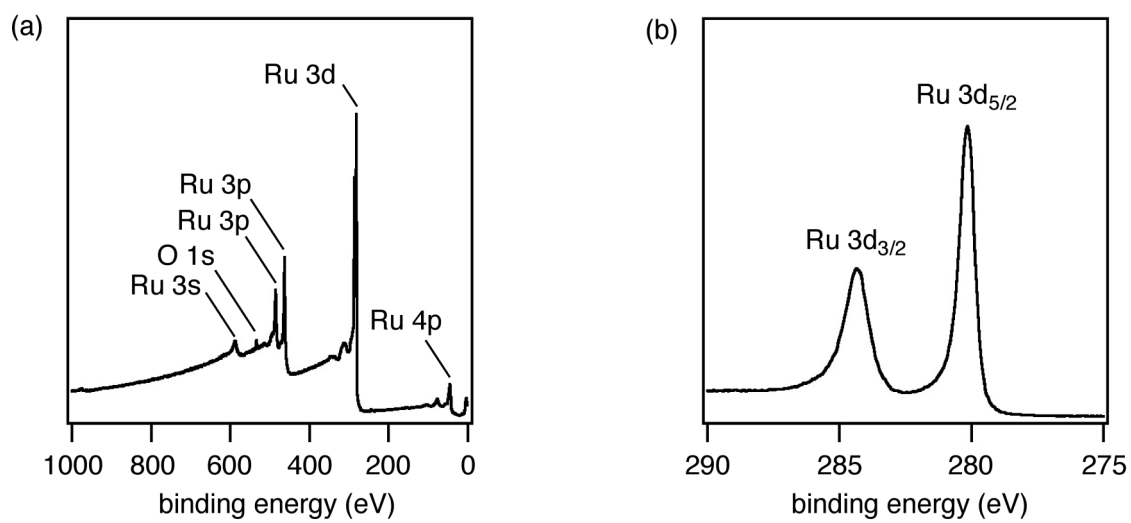


**Fig. S12** (a) An XRD pattern of Ru film deposited from **2** at 165 °C on SiO<sub>2</sub> substrates under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm). (b) Magnification of Ru(100), Ru(002) and Ru(101) peaks in (a).

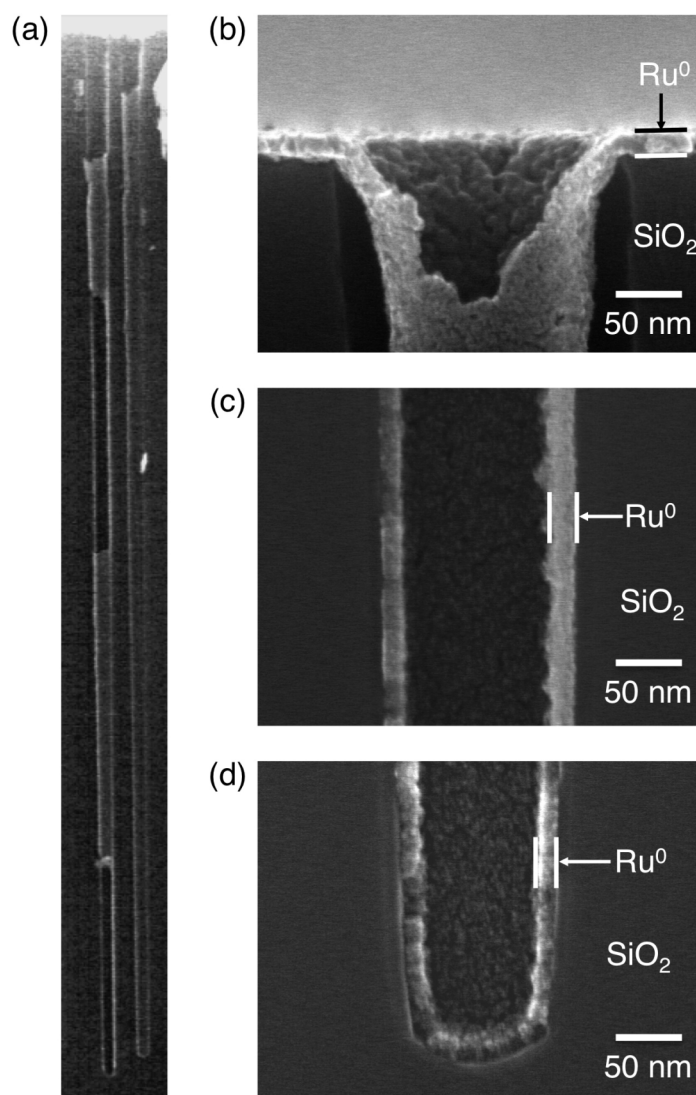


**Fig. S13** (a) An XPS spectrum of a Ru film deposited from **1** at 165 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm). Peaks for O 1s and Si 2p originate from a SiO<sub>2</sub> substrate. (b) Magnification of Ru 3d<sub>3/2</sub> and 3d<sub>5/2</sub> peaks in (a).

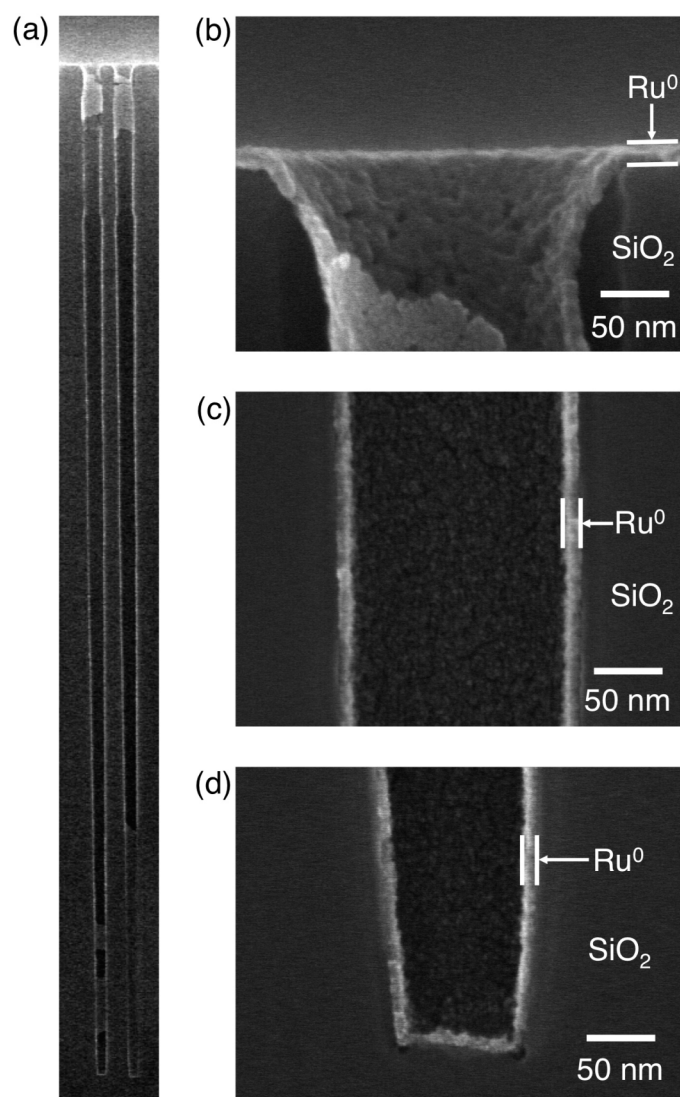




**Fig. S14** (a) An XPS spectrum of a Ru film deposited from **3** at 175 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm). Peaks for O 1s and Si 2p originate from a SiO<sub>2</sub> substrate. (b) Magnification of Ru 3d<sub>3/2</sub> and 3d<sub>5/2</sub> peaks in (a).



**Fig. S15** (a) A SEM image of holes with aspect ratios 40:1. A Ru film was deposited at 155 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm) from complex **1**. Magnified images of (b) top, (c) middle and (d) bottom of the hole.



**Fig. S16** (a) A SEM image of holes with aspect ratios 40:1. A Ru film was deposited at 165 °C under a flow of N<sub>2</sub> (10 sccm) and H<sub>2</sub> (1 sccm) from complex **3**. Magnified images of (b) top, (c) middle and (d) bottom of the hole.