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Supplementary Materials for

Different motilities of microtubules driven by kinesin-1 and kinesin-14 motors patterned on nanopillars

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The PDF file includes:

Other Supplementary Material for this manuscript includes the following:

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Supplementary figures

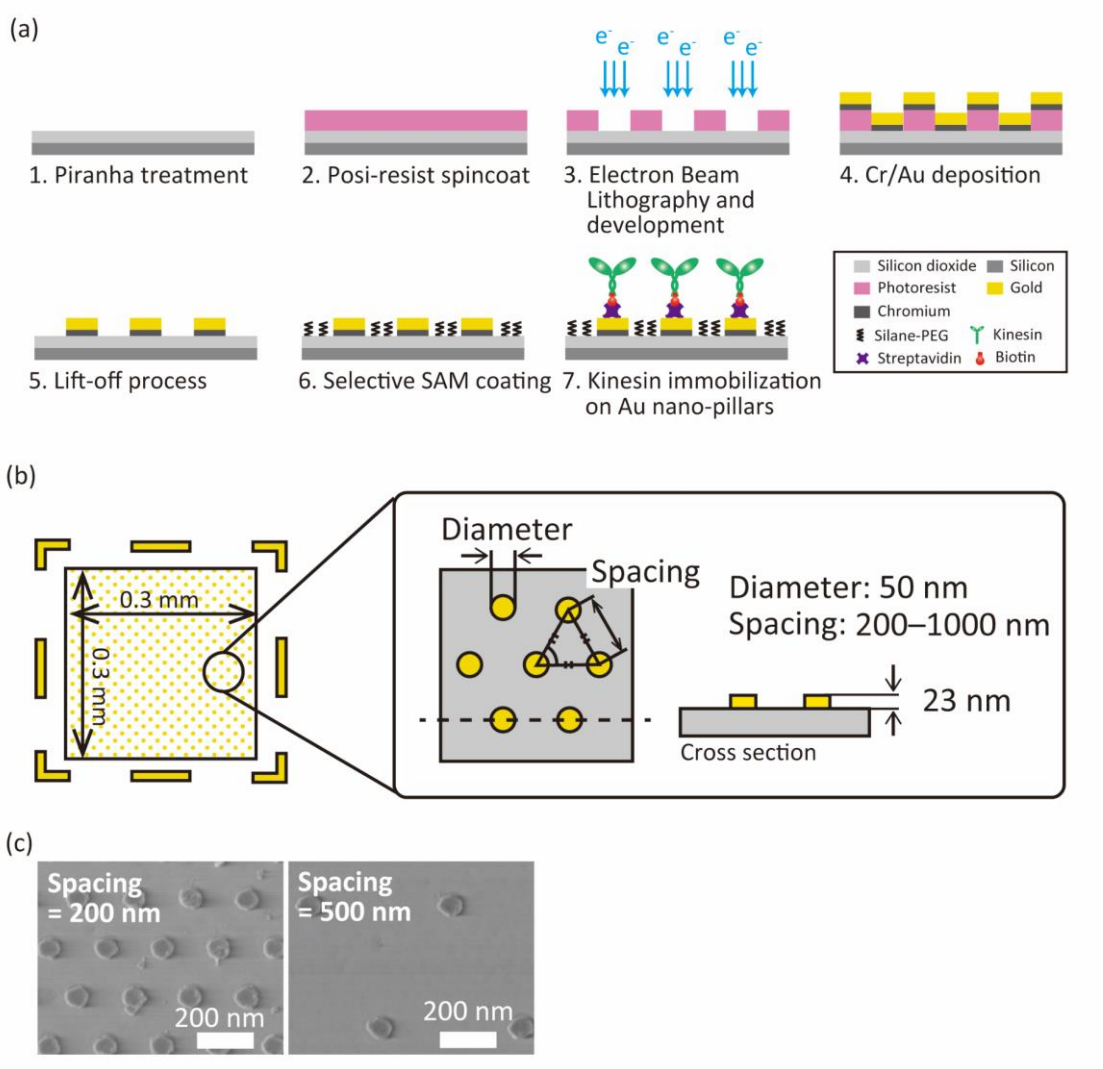

Fig. S1. Fabrication of the gold nanopillars. (**a**) Fabrication process. (**b**) Design of gold nano-pillars. (**c**) SEM images of fabricated gold nano-pillars after the lift-off process.

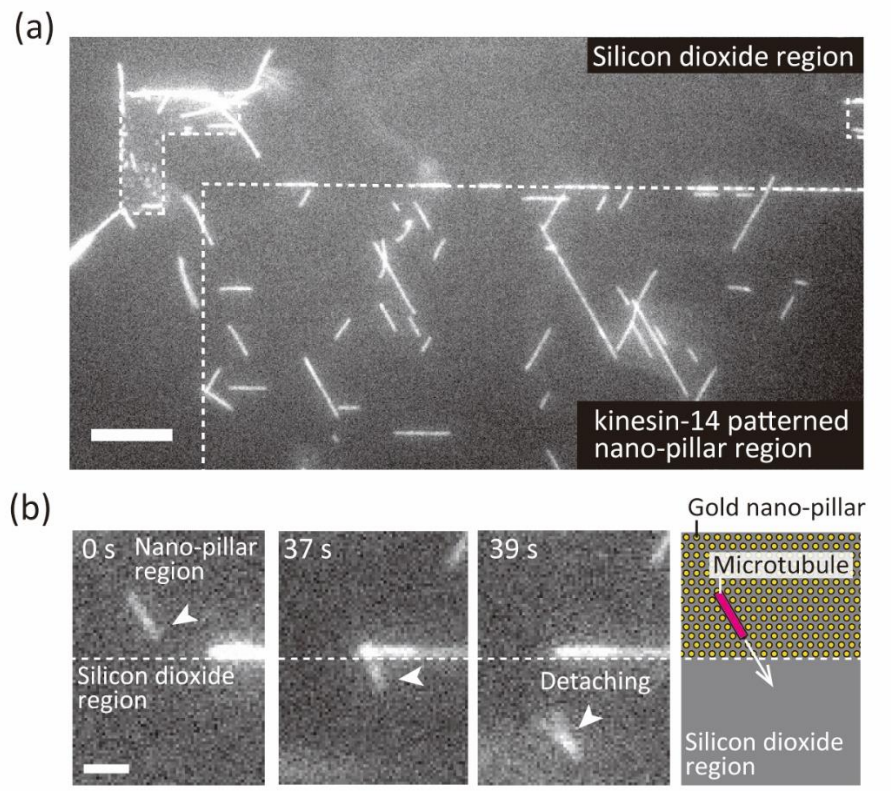

Fig. S2. Fluorescence images of microtubules gliding in the kinesin-14–patterned region on gold nanopillars. (**a**) Microtubules gliding at the boundary of the passivated silicon dioxide region and the kinesin-14 patterned region on gold nano-pillars. The L-shaped area in the upper left region is a gold pattern used to identify the position of nano-pillar region. Scale bar, 10 μm. (**b**) Sequential images of a microtubule at the boundary between the kinesin-14 patterned region on the gold nano-pillars and in the silicon dioxide region. Scale bar, 2 μm.

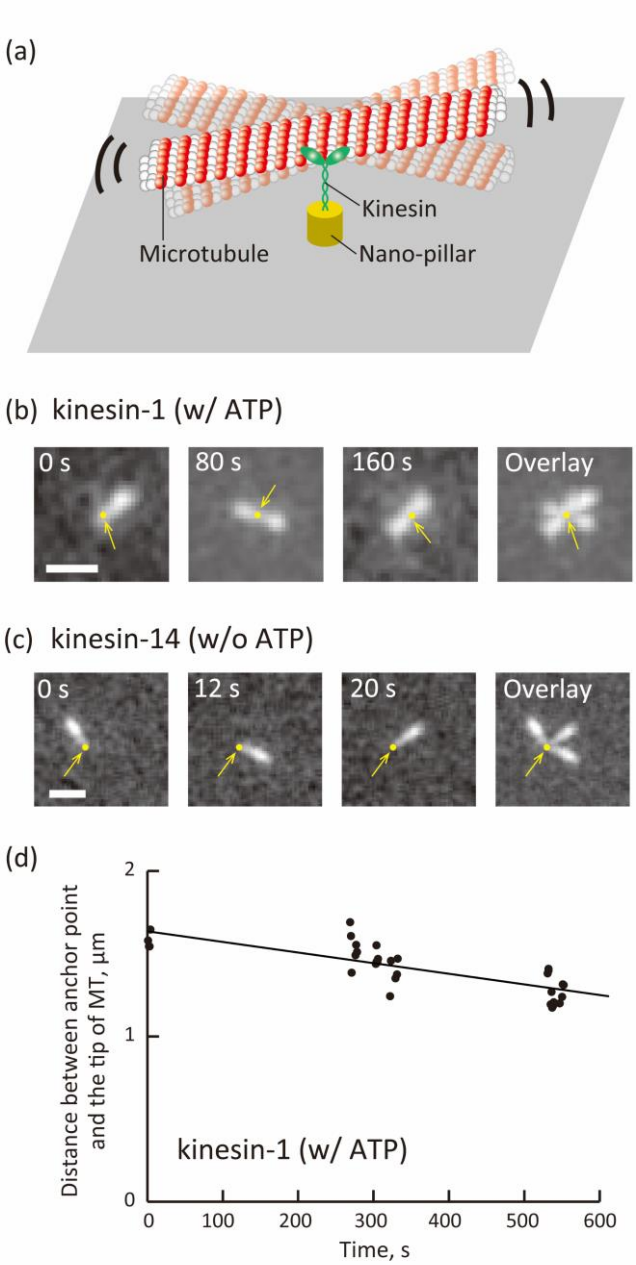

Fig. S3. Pivoting motion of a microtubule driven by a single kinesin motor on a nanopillar. (**a**) Schematic illustration of a microtubule showing pivoting motion on a nano-pillar. (**b**, **c**) Sequential fluorescence images of a pivoting microtubule on a nano-pillar with (b) kinesin-1, and (c) kinesin-14. The yellow dot and arrow suggest the estimated anchorage point of microtubule, i.e., the position of a nano-pillar. Scale bar, 2 µm. (**d**) Distance between the anchor points and the tip of the microtubule.

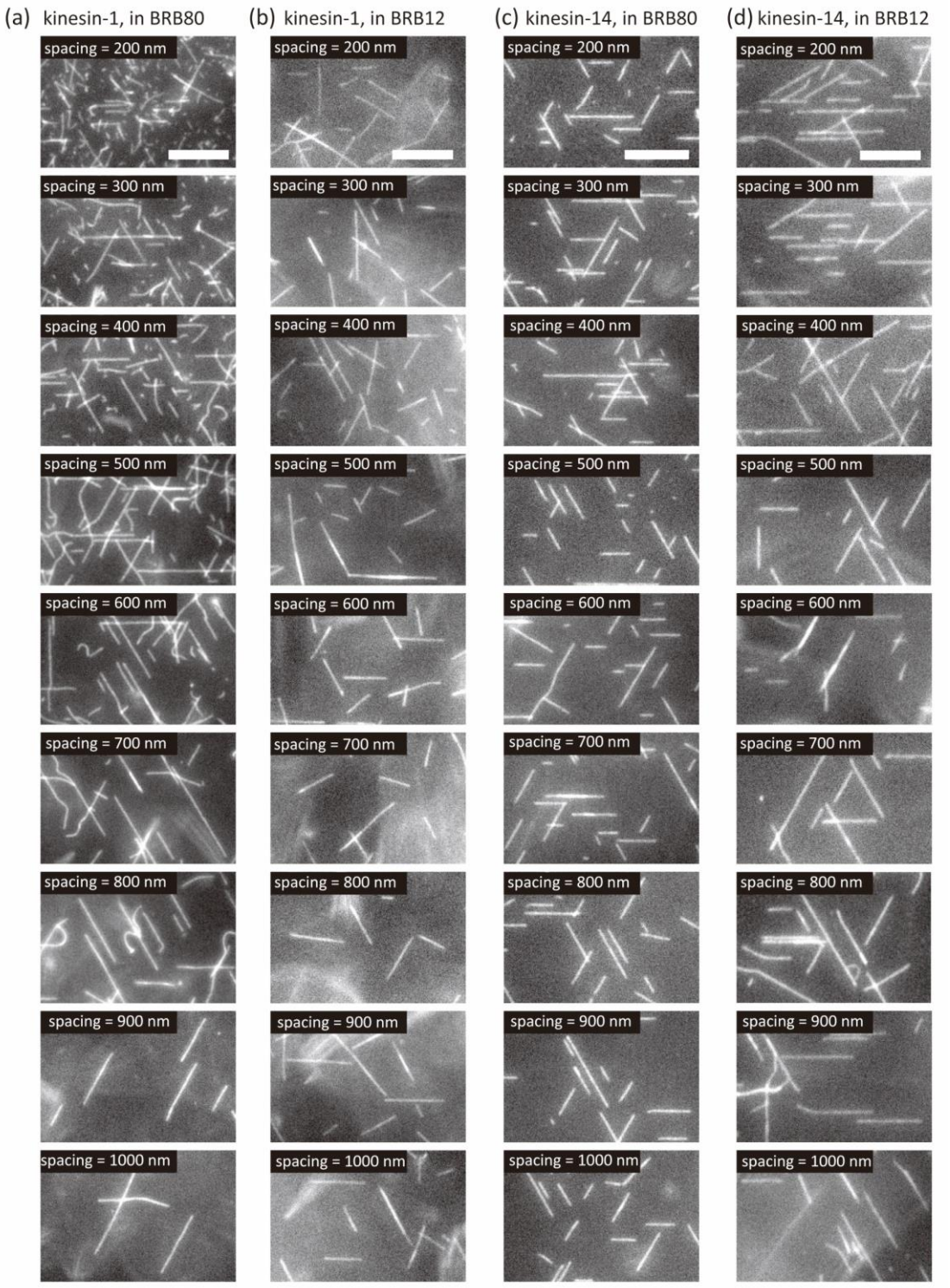

Fig. S4. Fluorescence images of microtubules on patterned kinesin-1 or kinesin-14. (**a**, **b**) Microtubules on patterned kinesin-1 with 200–1000 nm pillar spacing in (a) BRB80 buffer and (b) BRB12 buffer. (**c**, **d**) Microtubules on patterned kinesin-14 with 200–1000 nm pillar spacing in (d) BRB80 buffer and (d) BRB12 buffer. Scale bar, 10 μm.

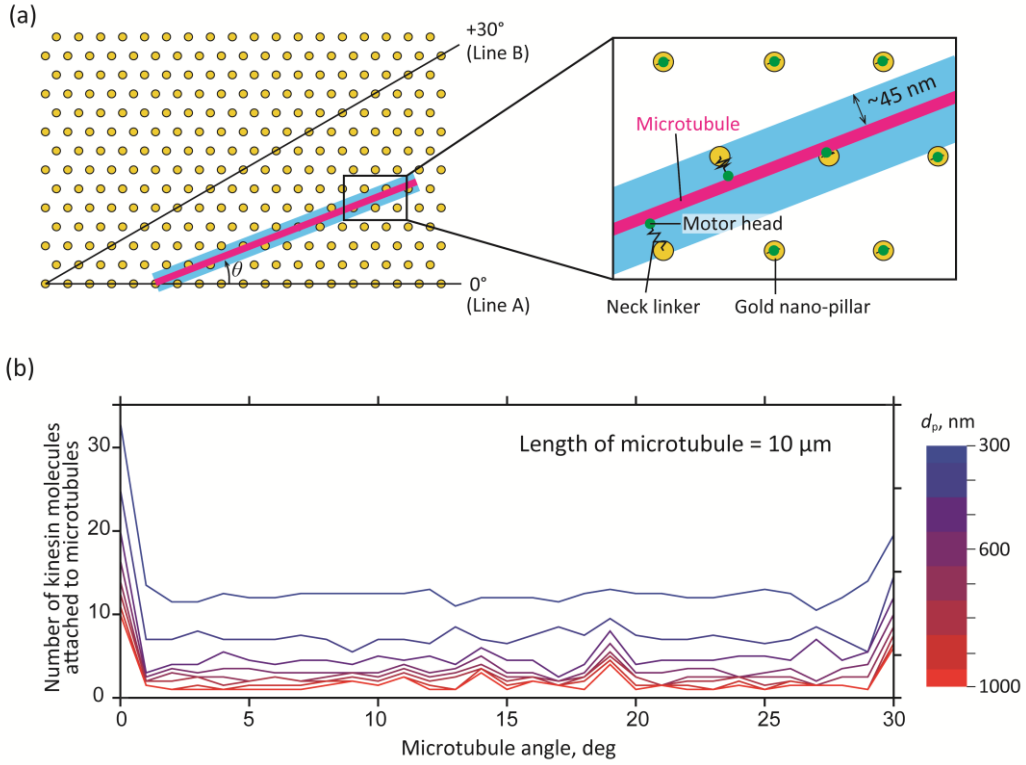

Fig. S5. Relationship between microtubule angle and the number of kinesin molecules attached to the microtubules. (**a**) Schematic illustration of a microtubule on patterned kinesin molecules. When the distance between the longitudinal axis of the microtubules and the position of kinesin molecules (pillars) is less than 45 nm (*42*), the kinesins can attach to the microtubule by extending their neck linker. (**b**) The relationship between the microtubule angle and the number of kinesin molecules that can attach to the microtubule. The number of kinesin molecules was defined as the number of kinesin molecules within 45 nm from the microtubules. Length of the microtubule = 10 µm. d_p: the designed spacing of pillars.

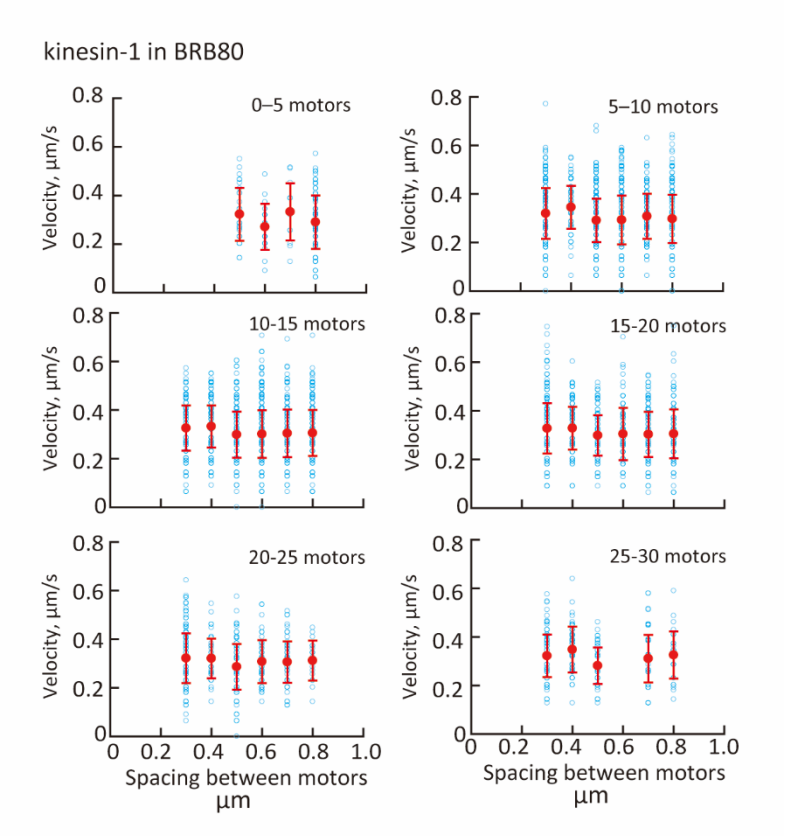

Fig. S6. Dependence of microtubule velocity on the spacing of kinesin-1 in BRB80. Blue open circles represent individual measurements, and red circles represent the average velocity. Means ± S.D.

Supplementary videos

Movie S1. Microtubules gliding in the kinesin-1–patterned region on the gold nanopillars. The white dotted line indicates the boundary of the passivated silicon dioxide region and the kinesin-1 patterned region on the gold nano-pillars. Scale bar, 10 μm. The movie corresponds to still images of Fig. 1c.

Movie S2. Microtubule at the boundary between the kinesin-1–patterned region on the gold nanopillars and passivated silicon dioxide region. The white dotted line indicates the boundary of the passivated silicon dioxide region and the kinesin-1 patterned region on the gold nano-pillars. Scale bar, 2 μm. The movie corresponds to the still images of Fig. 1d.

Movie S3. Microtubules gliding in the kinesin-14–patterned region on the gold nanopillars. The white dotted line indicates the boundary of the passivated silicon dioxide region and the kinesin-14 patterned region on gold nano-pillars. The L-shaped area in the upper left is a gold pattern used to identify the position of the nano-pillar region. Scale bar, 10 μm. The movie corresponds to the still images of fig. S2a.

Movie S4. Microtubule at the boundary between the kinesin-14–patterned region on the gold nanopillars and passivated silicon dioxide region. The white dotted line indicates the boundary of the passivated silicon dioxide region and the kinesin-14 patterned region on the gold nano-pillars. Scale bar, 2 μm. The movie corresponds to the still images of fig. S2b.