

Abstract Submitted  
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**Influence of side chain length and volume fraction on the morphology of bottlebrush block copolymers**<sup>1</sup> YUE GAI, DONG-PO SONG, BENJAMIN YAVITT, JAMES WATKINS<sup>2</sup>, University of Massachusetts, Amherst — A systematic study was conducted to investigate the morphology transitions that occur in polystyrene-block-poly (ethylene oxide) (PS-b-PEO) bottlebrush block copolymers (BBCP) upon varying PEO volume fraction (fPEO) from 16 % to 81 %. A series of PS-b-PEO BBCPs with different PEO side chain lengths were prepared using ring opening metathesis polymerization of PEO-norbornene (PEO-NB) ( $M_n \sim 2.0$  or  $5.0$  kg/mol) and PS-norbornene (PS-NB) ( $M_n \sim 3.5$  kg/mol) macromonomers. Symmetric and asymmetric lamellar morphologies were observed in the BBCPs over an exceptionally wide range of fPEO from 28 % to 72 %. Temperature controlled SAXS and WAXS revealed the presence of high order reflections arising from phase segregation above the PEO melting point. A progression from strong to weak phase segregation was observed over a temperature range of 150-180 Celsius degrees. The findings in this study provide insight into the rich phase behavior of this relatively new class of macromolecules, and may lay the groundwork for their use as templates directing the nanofillers with high aspect ratio.

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