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Impurity Decoration for Crystal Shape Control: C\textsubscript{60} on Ag(111)

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U. of Maryland, College Park — The decoration of hexagonal Ag/Ag(111) monolayer islands by chains of C\textsubscript{60}, observed via STM at 300K, dramatically changes their shape and fluctuations. We tune coverage so that a single C\textsubscript{60} chain fully decorates each Ag island boundary.\textsuperscript{3} The C\textsubscript{60}-induced rounding appears due to competing energetic and entropic effects.\textsuperscript{4} We estimate the Ag - C\textsubscript{60} and C\textsubscript{60} - C\textsubscript{60} attractions as \sim 0.13 eV and \sim 0.04 eV, respectively.\textsuperscript{5} The edge fluctuations are remarkable: 1) C\textsubscript{60} decoration does not notably impede the step-edge diffusion (SED) and 2) while the bare-island fluctuations are driven by SED, the decorated island has the signature of non-conserved dynamics, even though the C\textsubscript{60}s remain at the island edge. We suggest that rapidly diffusing Ag atoms randomly attracting the nearby C\textsubscript{60}s. Generalizations of our model show that both spherical and rectangular decorating molecules will similarly lower the energy of highly-kinked boundaries, leading to similar island shape changes.

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\textsuperscript{3}C.G. Tao et al., PRB 73, 125436 (2006); Nano Letters 7, 1495 (2007).
\textsuperscript{5}T.J. Stasevich et al., submitted.

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