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Inducing Strong Magnetism in Silicene Nanoflakes through Hydrogenation SADEGH MEHDI AGHAEI, INGRID TORRES, IRENE CALIZO, Florida Intl Univ, QUEST LAB TEAM — The properties of 2D materials considerably change in low dimensional forms due to quantum confinement effect. The zero dimensional silicene nanoflake (SiNF) has great potential to increase performance with miniaturization. In this study, density functional theory calculations were used to examine the electronic and magnetic properties of SiNFs. It was discovered that hexagonal SiNFs exhibit non-magnetic semiconducting behavior, while triangular SiNFs are magnetic semiconductors. One approach to effectively tune the properties of SiNFs is hydrogenation due to its fine reversibility and controllability. The half-hydrogenated SiNFs were observed to offer a giant spin moment which is directly proportional to the square of the flakes size (n). The total magnetic moment for hexagonal and triangular half-hydrogenated SiNFs are found to be $3n^2$ and $(n^2+5n)/2$, respectively. These nanoflakes could potentially be used for spintronic circuit devices since it has been demonstrated that strong induced spin magnetizations aligned parallel and show a substantial collective behavior by large range ferromagnetic exchange coupling. SiNFs based spin switches are offered to reveal the tuning transport properties by controlling the hydrogen coverage.

Sadegh Mehdi Aghaei
Florida Intl Univ

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