Metastable States Induced by Elastic Interactions in Spin-Crossover Materials

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Spin-crossover (SCO) compounds are fascinating materials that exhibit colorful phase transitions induced by temperature, pressure, photoirradiation, etc. The elastic interaction arising from lattice distortion due to molecular size difference between the low-spin (LS) and high-spin (HS) molecules plays a crucial role in the cooperativity of these transitions. This elastic interaction gives rise to both short-range and effective long-range interactions. Elastic frustration leads to competition between these interactions, resulting in a variety of thermodynamic and metastable phases (Fig. 1) [1-6]. We studied the properties of metastable phases in several SCO systems by constructing elastic interaction models [1-6]. Through phase diagram analysis, we identified diverse patterns of thermally induced SCO transitions with stepwise behavior [4–6]. Additionally, we examined stepwise SCO transitions in a core-shell SCO nanocomposite model consisting of two different SCO compounds [6]. We analyzed two cases: the core has a lower transition temperature than the shell, and the core has a higher transition temperature. In this presentation, we discuss the thermodynamic properties of symmetry-breaking phases and the stepwise SCO transition patterns that emerge from these interactions.

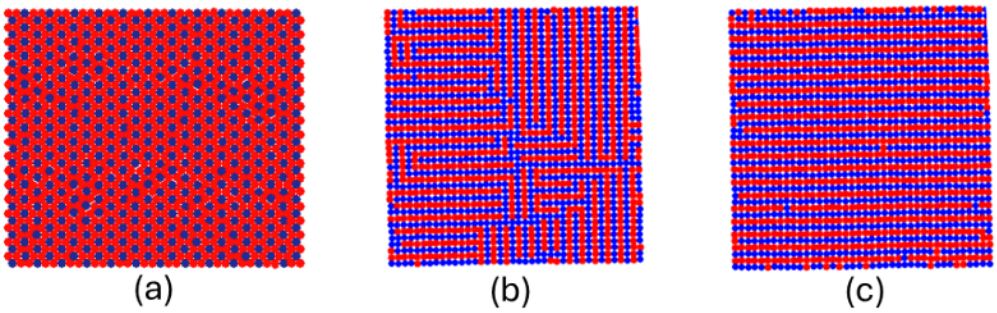

Fig. 1. (a) HS-rich ferrimagnetic-like pattern, (b) maze-like pattern, (c) stripe pattern. Red and blue spheres are denote HS and LS molecuels, respectively.

References

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