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Investigation of locally favored structures in Al-La-Ni metallic glasses using ^{27}Al NMR Spectroscopy MAGDALENA SANDOR, XUEKUI XI, YUE WU, Department of Physics and Astronomy, University of North Carolina — Al-TM-RE (TM= transition metal, RE = rare earth) bulk metallic glasses (BMGs) with high Al content have gained much research interest due to their high potential as structural and functional materials. The first recent fabrication of $La_{85-x}Al_xNi_{15}$ ($15 \leq x \leq 70$) BMGs have inspired an NMR systematic study of their locally favored structures (LFSs). These BMGs are reported to show characteristics of high thermal stability, fragility, and considerable mechanical strength. ^{27}Al NMR spectroscopy and nutation experiments are performed to unveil the sensitive structural dependence on line width and quadrupolar frequency with Al composition. It is observed that maximum glass forming ability (GFA) for this system prefers a decrease of symmetry at Al sites. Minimal GFA corresponding to instances of high symmetry occur in Al-rich and Al-poor regimes. These results, in addition to previous work, suggest that Ni and La atoms have unique local chemical and topological environments at different Al compositions. The monotonic decrease of relatively small ^{27}Al Knight shifts with increasing Al concentration demonstrates the evolution of local electronic structure at Al sites. This study is valuable in correlating the unique role that TM and RE elements play in local compositional and geometrical order of high glass-forming Al-based BMGs.

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