1. **Research Title:** Knowledge Graphs for Materials Research
2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**
   Computer Science, Computer Engineering, Mathematics, all engineering fields

4. **Objectives:** To integrate methods from knowledge engineering, materials science and engineering, and artificial intelligence to produce robust, secure, and trustworthy neurosymbolic AI to accelerate scientific progress in specific domains.
5. **Description:** Knowledge graphs, and other forms of symbolic AI systems (e.g., ontology) provide a mechanism to describe formally and rigorously domain knowledge. However, they tend to be brittle in the face of noisy data, and have difficulty scaling when the knowledge layer is complex. Neural systems, especially advanced generative AI, can operate over vast amounts of data (and to some extent, knowledge), but they tend to struggle with complex reasoning tasks and suffer from hallucination/confabulation in creative tasks. By fusing the two, resulting in neurosymbolic systems, the weaknesses of each can be overcome. This is appropriate for materials science and engineering, where the domain knowledge is complex and nuanced, the search space is vast, and the data generally heterogeneous. This topic seeks novel and innovative approaches to tackle MS problems with these combined systems.
6. **Research Classification/Restrictions:**
   Research will be Basic, fundamental research for Distribution A, Publicly Disclosable
7. **Eligible Research Institutions:** All DAGSI institutions
8. **PA Approval #:** Case Number: AFRL-2025-4107