Single Phase High Entropy Intermetallics And Method For Manufacturing

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CONTACT

Edward Hsieh
hsiehe5@uci.edu
tel: 949-824-8428.

OTHER INFORMATION

CATEGORIZED AS

» **Materials & Chemicals**
» Thin Films

RELATED CASES

2021-745-0

BRIEF DESCRIPTION

A novel method to form single-phase high entropy silicide materials by multilayer metal deposition and controlled heat treatment on silicon substrates.

FULL DESCRIPTION

This technology involves depositing at least two metal layers—such as Cr, Mo, Ta, Nb, and V—onto a silicon substrate to create a thin, multilayer film, followed by heat treatment that promotes interdiffusion between the metals and silicon. This process forms single-phase high entropy silicide materials, including ternary (CrMoTa)Si2 and quinary (CrMoTaVNb)Si2 compositions, characterized by a C40 hexagonal crystal structure. The candidate compositions are identified using the CALPHAD approach and experimentally synthesized by electron beam evaporation followed by vacuum heat treatment.

SUGGESTED USES

- Advanced semiconductor and microelectronic device fabrication
- Protective and wear-resistant coatings in aerospace and automotive industries
- High-temperature structural materials for energy and industrial applications
- Development of novel thin film materials for sensors and MEMS devices
- Materials research and development for next-generation electronics

ADVANTAGES

- Enables formation of single-phase high entropy silicides with controlled composition
- Utilizes electron beam evaporation for precise, sequential metal layer deposition
- Employs CALPHAD modeling to identify optimal silicide compositions
- Produces silicides with enhanced structural stability and hexagonal crystal phase
- Flexible processing allowing sequential or concurrent deposition and heat treatment

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230407460	12/21/2023	2021-745

RELATED MATERIALS

- Vyatskikh, A. L., MacDonald, B. E., Dupuy, A. D., Lavernia, E. J., Schoenung, J. M., & Hahn, H. (2021). High entropy silicides: CALPHAD-guided prediction and thin film fabrication. Scripta Materialia, 201, 113914.

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5270 California Avenue / Irvine,CA 92697-7700 / Tel: 949.824.2683

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