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# Determination of the thermodynamic properties of the $\text{Ag}_2\text{CdSn}_3\text{S}_8$ and $\text{Ag}_2\text{CdSnS}_4$ phases in the Ag–Cd–Sn–S system by the solid-state electrochemical cell method

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## ABSTRACT

Triangulation of the quaternary Ag–Cd–Sn–S system in the  $\text{Ag}_2\text{SnS}_3$ – $\text{SnS}$ – $\text{Sn}_2\text{S}_3$ – $\text{CdS}$  part below  $T = 600$  K was performed using X-ray diffraction method. The spatial position of the determined four-phase regions regarding the figurative point of silver was used to write forming chemical reactions. The forming reactions were performed by applying electrochemical cells (ECCs):  $(-)\text{C} | \text{Ag} | \text{Ag}_2\text{GeS}_3 \text{ glass} | \text{Ag}_2\text{CdSn}_3\text{S}_8, \text{SnS}, \text{Sn}_2\text{S}_3, \text{CdS} | \text{C} (+)$  and  $(-)\text{C} | \text{Ag} | \text{Ag}_2\text{GeS}_3 \text{ glass} | \text{Ag}_2\text{CdSnS}_4, \text{SnS}, \text{Ag}_2\text{CdSn}_3\text{S}_8, \text{CdS} | \text{C} (+)$ , where C is graphite and  $\text{Ag}_2\text{GeS}_3$  glass is the fast purely  $\text{Ag}^+$  ions conducting electrolyte. The linear dependencies of the EMF of the ECCs on temperature in the range  $T = (462\text{--}500)$  K were used to calculate the standard thermodynamic values of the  $\text{Ag}_2\text{CdSn}_3\text{S}_8$  and  $\text{Ag}_2\text{CdSnS}_4$  phases for the first time.

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