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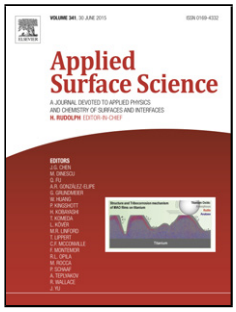

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PII: S0169-4332(17)32363-2
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2017.08.038
Reference: APSUSC 36875

To appear in: *APSUSC*

Received date: 1-5-2017
Revised date: 22-7-2017
Accepted date: 4-8-2017

Please cite this article as: Chen Lai, Jinshu Wang, Fan Zhou, Wei Liu, Daniel den Engelsen, Naihua Miao, Emission and Evaporation Properties of 75at% Re-25at% W Mixed Matrix Impregnated Cathode, Applied Surface Sciencehttp://dx.doi.org/10.1016/j.apsusc.2017.08.038

Emission and Evaporation Properties of 75at% Re-25at% W Mixed Matrix Impregnated Cathode

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Highlights

1. The observed phase transformation of the 75Re matrix during operation of the cathode has no effect on the emission properties.
2. The metal states of $W^{\xi-}$ in the Ba-W cathode and $Re^{\xi-}$ in the 75Re cathode were found.
3. Rhenium increases the interaction between Ba of Ba-O-M (M: matrix) complex and matrix.

Abstract: We present a comprehensive study on the phase, emission performance, surface composition, chemical states and evaporation properties of a 75at% Re-25at% W (75Re) mixed matrix impregnated cathode by several modern analyzers, including XRD, electron emission test device, in situ AES, XPS and Quartz Crystal Oscillation Instrument (QCOI). On the basis of experimental results, the adsorption energy and charge transfer of the Ba-O dipole adsorbed on cathode surface was investigated by the first-principles density functional theory calculations. The in situ AES analyses indicate that the atomic ratio of Ba:O of the active emission layer on the cathode surface