



SUPPLEMENTARY MATERIAL TO
**Electrochemical deposition and characterization of
AgPd alloy layers**

NEVENKA R. ELEZOVIĆ^{1#}, PIOTR ZABINSKI², MILA N. KRSTAJIĆ PAJIĆ^{3#},
TOMASZ TOKARSKI⁴, BORKA M. JOVIĆ^{1#} and VLADIMIR D. JOVIĆ^{1*}

¹Institute for Multidisciplinary Research University of Belgrade, Kneza Višeslava 1, 11030 Belgrade, Serbia, ²AGH University of Science and Technology, Faculty of Non-Ferrous Metals, Al. Mickiewicza 30, 30-059 Krakow, Poland, ³Faculty of Technology and Metallurgy University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia and ⁴AGH University of Science and Technology, Academic Centre for Materials and Nanotechnology, Al. Mickiewicza 30, 30-059 Krakow, Poland

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TABLE S-I. Electrodeposition of the AgPd alloys to $Q_d = 0.2, 1.0$ and 1.5 C cm^{-2} at $\omega = 0$ rpm and different current densities (j_d) from the solution: $0.001 \text{ M PdCl}_2 + 0.04 \text{ M AgCl} + 0.1 \text{ M HCl} + 12 \text{ M LiCl}$. Dissolution (ALSV) in the solution $0.1 \text{ M HCl} + 12 \text{ M LiCl}$ at $\omega = 1000$ rpm with a sweep rate of 1 mV s^{-1} ; $j_L(\text{Pd}) = -59.18 \mu\text{A cm}^{-2}$

| Sample | j_d $\mu\text{A cm}^{-2}$ | $Q(\text{Pd})_{\text{ALSV}}$ C cm^{-2} | $Q(\text{Ag})_{\text{ALSV}}$ C cm^{-2} | $\eta_j / \%$ Q_{ALSV}/Q_d | Composition, at. % | | | | $Q(\text{UP})_{\text{ALSV}}$ % | | |
|-------------------------------|--------------------------------|--|--|--|--------------------|--------------|--------------|------|-----------------------------------|------|------|
| | | | | | ALSV Pd Ag | XPS Pd Ag | EDS Pd Ag | | | | |
| $Q_d = 0.2 \text{ C cm}^{-2}$ | | | | | | | | | | | |
| (1)AgPd1 | 178 | 0.088 | 0.093 | 90 | 24 | 76 | 27.4 | 72.6 | 16.2 | 83.8 | 0 |
| (2) | 296 | 0.059 | 0.139 | 96 | 12 | 88 | – | – | – | – | 15.7 |
| (3)AgPd2 | 415 | 0.042 | 0.154 | 98 | 8 | 92 | 13.4 | 86.6 | 9.8 | 90.2 | 10.2 |
| $Q_d = 1.0 \text{ C cm}^{-2}$ | | | | | | | | | | | |
| (4) | 296 | 0.290 | 0.700 | 99 | 12 | 88 | – | – | – | – | 17.2 |
| $Q_d = 1.5 \text{ C cm}^{-2}$ | | | | | | | | | | | |
| (5) | 296 | 0.469 | 1.018 | 99 | 13 | 87 | – | – | – | – | 27.6 |

* Corresponding author. E-mail: vladajovic@imsi.bg.ac.rs

TABLE S-II. Electrodeposition of the AgPd alloys to the different amounts of charge (Q_d) at $j_d = -178 \mu\text{A cm}^{-2}$ ($j_d = 3j_L(\text{Pd})$) and $\omega = 0$ rpm from the solution: 0.001 M PdCl₂ + 0.04 M AgCl + 0.1 M HCl + 12 M LiCl. Dissolution (ALSV) in the solution 0.1 M HCl + 12 M LiCl at $\omega = 1000$ rpm with a sweep rate of 1 mV s⁻¹. at.% of Pd and Ag, as well as $Q(\text{UP})$, are obtained from the ALSV responses

| $Q_d / \text{C cm}^{-2}$ | $Q(\text{Pd})_{\text{ALSV}}$ C cm^{-2} | $Q(\text{Ag})_{\text{ALSV}}$ C cm^{-2} | $\eta_j / \%$ Q_{ALSV}/Q_d | Pd | Ag | $Q(\text{UP})_{\text{ALSV}} / \%$ |
|--------------------------|--|--|--|----|----|-----------------------------------|
| 0.05 | 0.0243 | 0.0191 | 73 | 38 | 62 | 0 |
| 0.1 | 0.043 | 0.043 | 86 | 33 | 67 | 0 |
| 0.2 | 0.097 | 0.088 | 93 | 35 | 65 | 0 |
| 0.4 | 0.176 | 0.206 | 96 | 30 | 70 | 16 |
| 0.6 | 0.312 | 0.267 | 97 | 37 | 63 | 23 |

TABLE S-III. Electrodeposition of AgPd alloys to the different amounts of charge (Q_d) at different current densities and $\omega = 1000$ rpm from the solution: 0.001 M PdCl₂ + 0.04 M AgCl + 0.1 M HCl + 12 M LiCl. Dissolution (ALSV) in the solution 0.1 M HCl + 12 M LiCl at $\omega = 1000$ rpm, with a sweep rate of 1 mV s⁻¹

| Sample | Q_d C cm^{-2} | $Q(\text{Pd})_{\text{ALSV}}$ C cm^{-2} | $Q(\text{Ag})_{\text{ALSV}}$ C cm^{-2} | $\eta_j / \%$ Q_{ALSV}/Q_d | Composition, % | | | | | | $Q(\text{UP})_{\text{ALSV}}$ % |
|--|-----------------------------|--|--|--|----------------|------|------|------|-----|------|-----------------------------------|
| | | | | | ALSV | | XPS | | EDS | | |
| | | | | | Pd | Ag | Pd | Ag | Pd | Ag | |
| $j_d = -5 \text{ mA cm}^{-2}; \omega = 1000 \text{ rpm}$ | | | | | | | | | | | |
| (1) | 1.0 | 0.195 | 0.796 | 99 | 11 | 89 | - | - | - | - | 4 |
| (2) | 2.0 | 0.214 | 1.512 | 86 | 7 | 93 | - | - | - | - | 40 |
| $j_d = -7 \text{ mA cm}^{-2}; \omega = 1000 \text{ rpm}$ | | | | | | | | | | | |
| (3)AgPd3 | 3.0 | 0.649 | 2.065 | 90 | 13.4 | 86.6 | 15.2 | 84.8 | 3.4 | 96.6 | 55 |

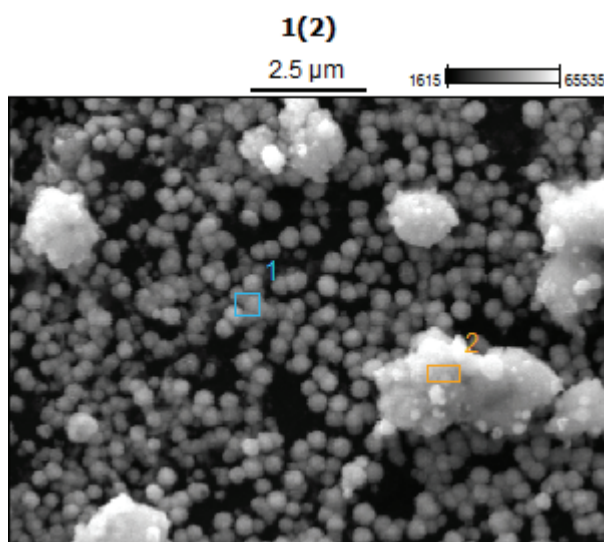
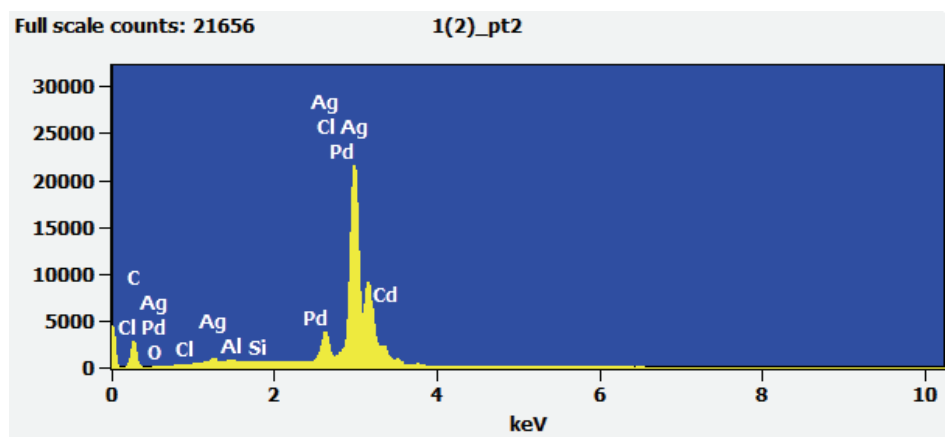
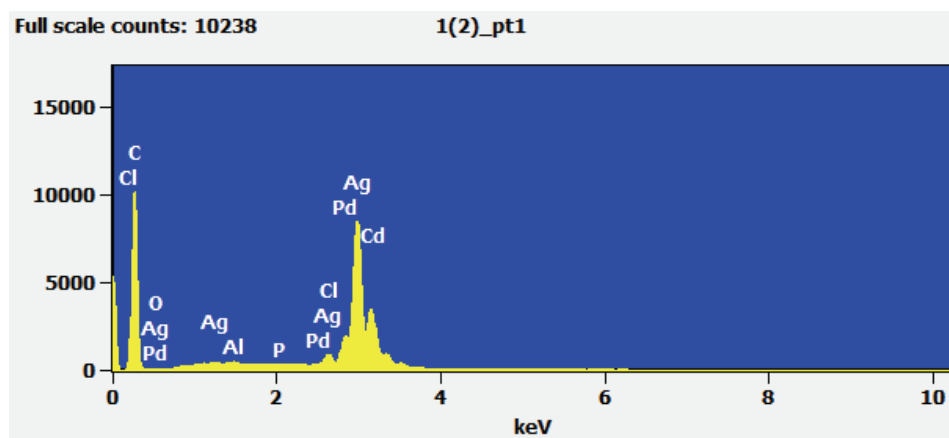
Sample AgPd1

Image Name: 1(2)
Image Resolution: 512 by 384
Image Pixel Size: 0.03 μm
Acc. Voltage: 20.0 kV
Magnification: 10000



Weight %

| | C-K | O-K | Al-K | Si-K | P-K | Cl-K | Pd-L | Ag-L | Cd-L |
|-----------------|-------|------|------|------|------|------|------|-------|------|
| 1(2)_pt1 | 46.65 | 0.00 | 0.24 | | 0.09 | 0.72 | 8.86 | 43.44 | 0.00 |
| 1(2)_pt2 | 12.86 | 0.00 | 0.30 | 0.10 | | 3.27 | 2.01 | 81.46 | 0.00 |

Atom %

| | C-K | O-K | Al-K | Si-K | P-K | Cl-K | Pd-L | Ag-L | Cd-L |
|-----------------|-------|------|------|------|------|------|------|-------|------|
| 1(2)_pt1 | 88.23 | 0.00 | 0.20 | | 0.07 | 0.46 | 1.89 | 9.15 | 0.00 |
| 1(2)_pt2 | 54.87 | 0.00 | 0.58 | 0.18 | | 4.72 | 0.97 | 38.69 | 0.00 |

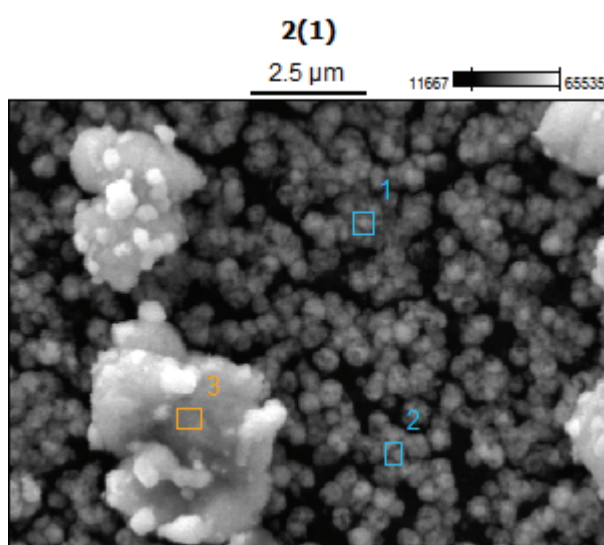
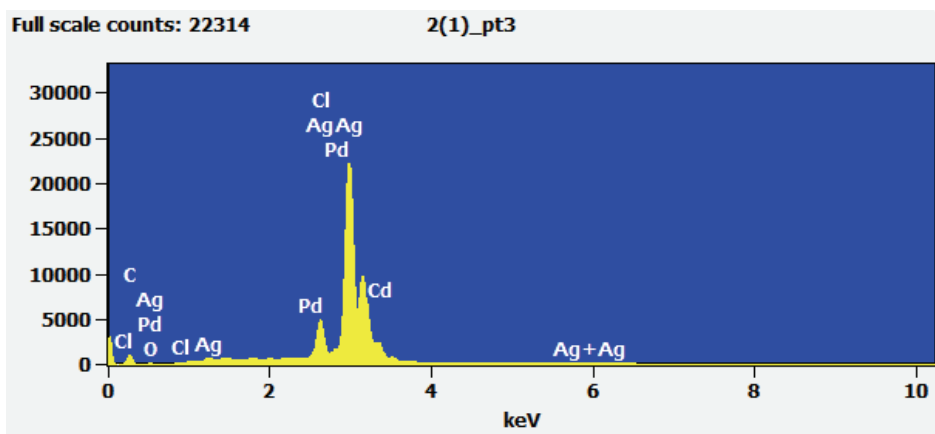
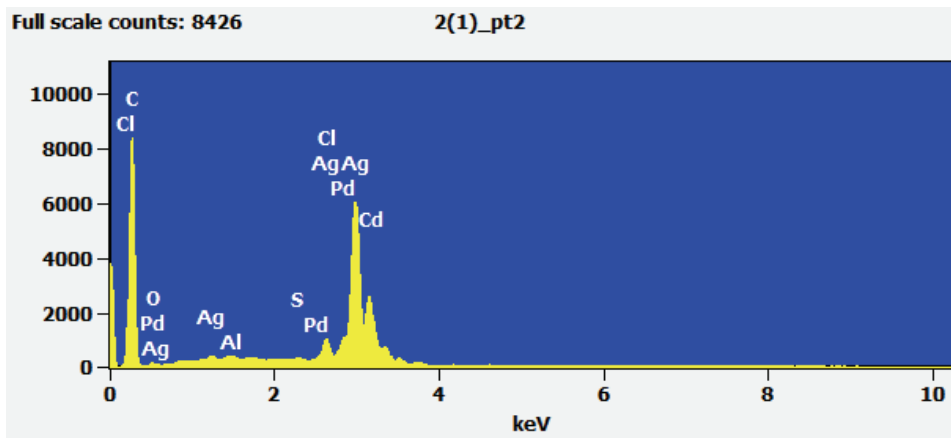
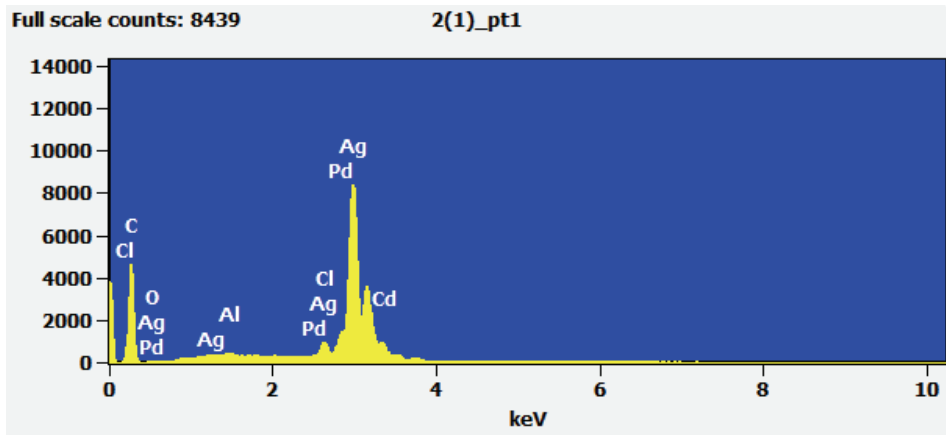
Sample AgPd2

Image Name: 2(1)
Image Resolution: 512 by 384
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Acc. Voltage: 20.0 kV
Magnification: 10000



Weight %

| | <i>C-K</i> | <i>O-K</i> | <i>Al-K</i> | <i>S-K</i> | <i>Cl-K</i> | <i>Pd-L</i> | <i>Ag-L</i> | <i>Cd-L</i> |
|-----------------|------------|------------|-------------|------------|-------------|-------------|-------------|-------------|
| 2(1)_pt1 | 30.83 | 1.40 | 0.37 | | 1.13 | 6.59 | 59.69 | 0.00 |
| 2(1)_pt2 | 52.32 | 0.00 | 0.20 | 0.08 | 1.33 | 4.20 | 41.86 | 0.00 |
| 2(1)_pt3 | 4.38 | 2.19 | | | 4.42 | 1.01 | 87.96 | 0.06 |

Atom %

| | <i>C-K</i> | <i>O-K</i> | <i>Al-K</i> | <i>S-K</i> | <i>Cl-K</i> | <i>Pd-L</i> | <i>Ag-L</i> | <i>Cd-L</i> |
|-----------------|------------|------------|-------------|------------|-------------|-------------|-------------|-------------|
| 2(1)_pt1 | 77.42 | 2.65 | 0.42 | | 0.96 | 1.87 | 16.69 | 0.00 |
| 2(1)_pt2 | 90.17 | 0.00 | 0.16 | 0.05 | 0.78 | 0.82 | 8.03 | 0.00 |
| 2(1)_pt3 | 25.12 | 9.41 | | | 8.58 | 0.65 | 56.19 | 0.03 |

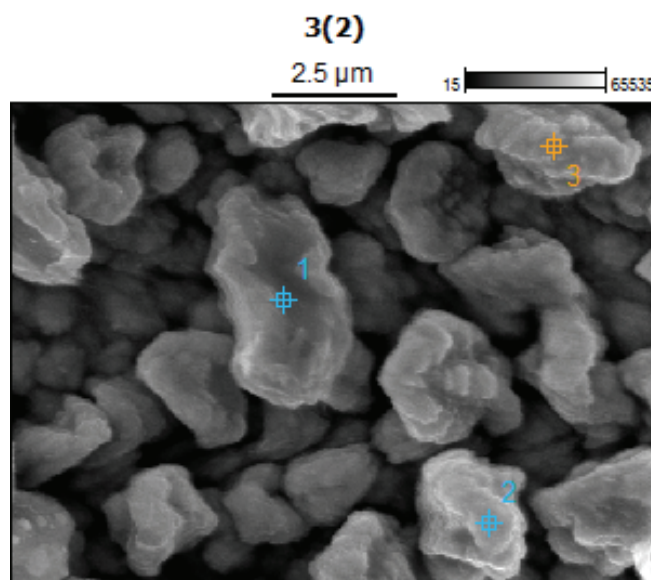
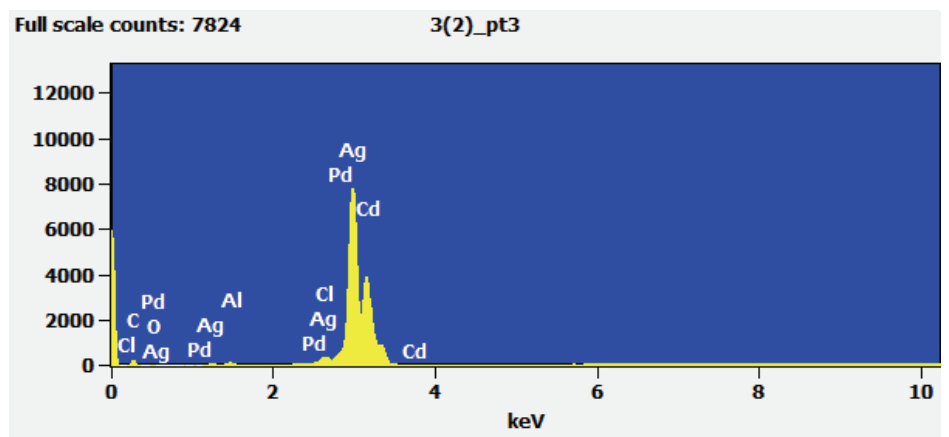
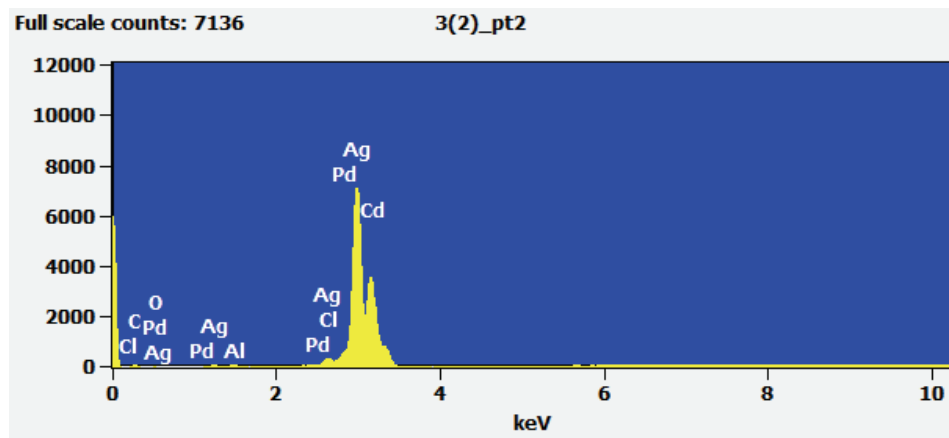
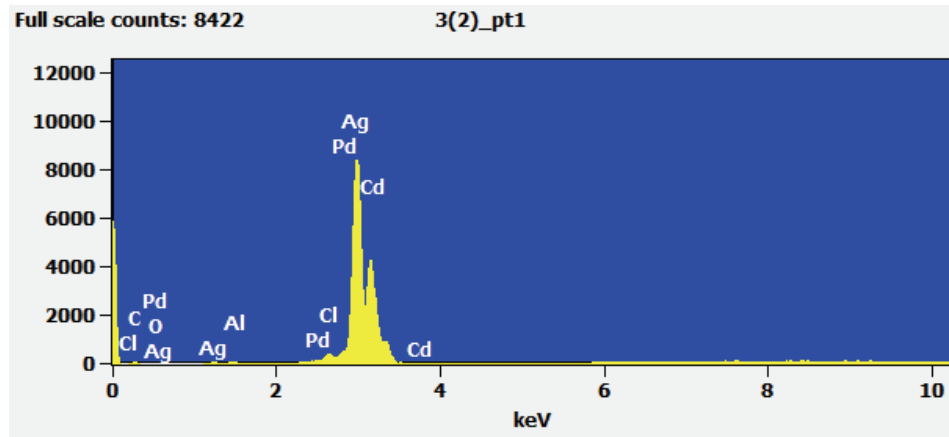
Sample AgPd3

Image Name: 3(2)
Image Resolution: 512 by 384
Image Pixel Size: 0.03 μm
Acc. Voltage: 20.0 kV
Magnification: 10000



Weight %

| | <i>C-K</i> | <i>O-K</i> | <i>Al-K</i> | <i>Cl-K</i> | <i>Pd-L</i> | <i>Ag-L</i> | <i>Cd-L</i> |
|-----------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 3(2)_pt1 | 1.08 | 0.38 | 0.66 | 0.00 | 1.44 | 86.33 | 10.11 |
| 3(2)_pt2 | 1.13 | 0.52 | 0.61 | 0.00 | 3.14 | 83.40 | 11.19 |
| 3(2)_pt3 | 2.29 | 0.56 | 0.83 | 0.00 | 3.48 | 82.56 | 10.29 |

Atom %

| | <i>C-K</i> | <i>O-K</i> | <i>Al-K</i> | <i>Cl-K</i> | <i>Pd-L</i> | <i>Ag-L</i> | <i>Cd-L</i> |
|-----------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 3(2)_pt1 | 8.66 | 2.30 | 2.33 | 0.00 | 1.30 | 76.78 | 8.63 |
| 3(2)_pt2 | 8.98 | 3.09 | 2.15 | 0.00 | 2.81 | 73.50 | 9.47 |
| 3(2)_pt3 | 16.62 | 3.07 | 2.68 | 0.00 | 2.85 | 66.79 | 7.99 |