# Thermally treated MgO/nanocrystalline cellulose immobilized onto Santa Barbara-16 mesoporous $SiO_2$ template for sequestration of antibiotics from polluted water

**Martins O. Omorogie[1,2,3,‡], Faith O. Ilesanmi[1,2], Moses O. Alfred[1,2], Brigitte Helmreich[3]**

[1]Department of Chemical Sciences, Faculty of Natural Sciences, Redeemer's University, P.M.B. 230, Ede, 232101, Nigeria

[2]Water Science and Technology Research Unit, African Centre of Excellence for Water and Environmental Research (ACEWATER), Redeemer's University, P.M.B. 230, Ede, 232101, Nigeria

[3]Chair of Urban Water Systems Engineering, Technical University of Munich (TUM), Am Coulombwall 3, 85748, Garching, Germany

‡*Corresponding Author:* omorogiem@run.edu.ng, mo.omorogie@tum.de

**Electronic Supplementary Information (ESI)**

**Tables**

*Table S1: Equilibrium table for AMP by MNCS-450, MNCS-650 and MNCS-850.*

| Adsorbents | MNCS-450 | | | MNCS-650 | | | MNCS-850 | | |
|---|---|---|---|---|---|---|---|---|---|
| Temperatures | 25 ℃ | 40 ℃ | 55 ℃ | 25 ℃ | 40 ℃ | 55 ℃ | 25 ℃ | 40 ℃ | 55 ℃ |
| FM | | | | | | | | | |
| $1/n$ | 1.129 | 1.283 | 2.592 | 0.722 | 0.837 | 0.926 | 1.055 | 1.135 | 1.321 |
| $K_F$ $(mg.g^{-1})(L.mg^{-1})^{1/n}$ | 0.642 | 1.285 | 2.294 | 1.874 | 2.016 | 2.381 | 2.677 | 2.544 | 2.879 |
| $r^2$ | 0.923 | 0.939 | 0.942 | 0.887 | 0.940 | 0.990 | 0.814 | 0.903 | 0.968 |
| LM | | | | | | | | | |
| $q_{max_L}$ $(mg.g^{-1})$ | 3.622 | 3.791 | 3.973 | 3.890 | 4.260 | 4.413 | 4.089 | 4.460 | 4.613 |
| $K_L$ $(L.mg^{-1})$ | 0.002 | 0.013 | 0.078 | 0.003 | 0.017 | 0.028 | 0.097 | 0.116 | 0.393 |
| $r^2$ | 0.927 | 0.951 | 0.963 | 0.931 | 0.937 | 0.970 | 0.972 | 0.978 | 0.986 |
| LFM | | | | | | | | | |
| $q_{max_{LF}}$ $(mg.g^{-1})$ | 3.527 | 3.840 | 4.147 | 4.053 | 4.241 | 4.382 | 4.226 | 4.587 | 4.888 |
| $K_{LF}$ $(mg.g^{-1})(L.mg^{-1})^{1/n}$ | 0.838 | 1.489 | 2.130 | 0.634 | 2.533 | 2.690 | 2.710 | 2.722 | 3.071 |
| $n_{LF}$ | 0.119 | 0.304 | 0.333 | 0.525 | 0.699 | 0.748 | 0.633 | 0.818 | 1.273 |
| $r^2$ | 0.991 | 0.992 | 0.994 | 0.995 | 0.996 | 0.998 | 0.992 | 0.994 | 0.995 |

*Table S2: Kinetic table for AMPby MNCS-450, MNCS-650 and MNCS-850.*

| AMP | | | |
|---|---|---|---|
| | MNCS-450 | MNCS-650 | MNCS-850 |
| PFOM | | | |
| $q_e$ (mg $g^{-1}$) | 3.309 | 4.020 | 4.500 |
| $k_1$ ($min^{-1}$) | 0.146 | 0.173 | 0.162 |
| $r^2$ | 0.973 | 0.988 | 0.932 |
| PSOM | | | |
| $q_e$ (mg $g^{-1}$) | 3.514 | 4.404 | 4.639 |
| $k_2$ ( g $mg^{-1}$ $min^{-1}$) | 0.035 | 0.046 | 0.044 |
| $r^2$ | 0.989 | 0.990 | 0.992 |
| MOM | | | |
| $q_e$ (mg $g^{-1}$) | 3.657 | 4.574 | 4.838 |
| $k_{1,2}$ (g $mg^{-1}$ $min^{-1}$) | 0.032 | 0.106 | 0.060 |
| $\eta$ | 0.839 | 0.494 | 0.958 |
| $r^2$ | 0.999 | 0.999 | 0.999 |

*Table S3: Kinetic table for CIPby MNCS-450, MNCS-650 and MNCS-850.*

| CIP | | | |
|---|---|---|---|
| | MNCS-450 | MNCS-650 | MNCS-850 |
| PFOM | | | |
| $q_e$ (mg $g^{-1}$) | 3.360 | 3.711 | 4.523 |
| $k_1$ ($min^{-1}$) | 0.035 | 0.027 | 0.021 |
| $r^2$ | 0.904 | 0.946 | 0.931 |
| PSOM | | | |
| $q_e$ (mg $g^{-1}$) | 3.549 | 3.835 | 4.630 |
| $k_2$ ( g $mg^{-1}$ $min^{-1}$) | 0.039 | 0.036 | 0.042 |
| $r^2$ | 0.988 | 0.989 | 0.989 |
| MOM | | | |
| $q_e$ (mg $g^{-1}$) | 3.640 | 3.906 | 4.891 |
| $k_{1,2}$ (g $mg^{-1}$ $min^{-1}$) | 0.009 | 0.006 | 0.008 |
| $\eta$ | 0.095 | 0.092 | 0.093 |
| $r^2$ | 0.997 | 0.998 | 0.999 |

**Figures**

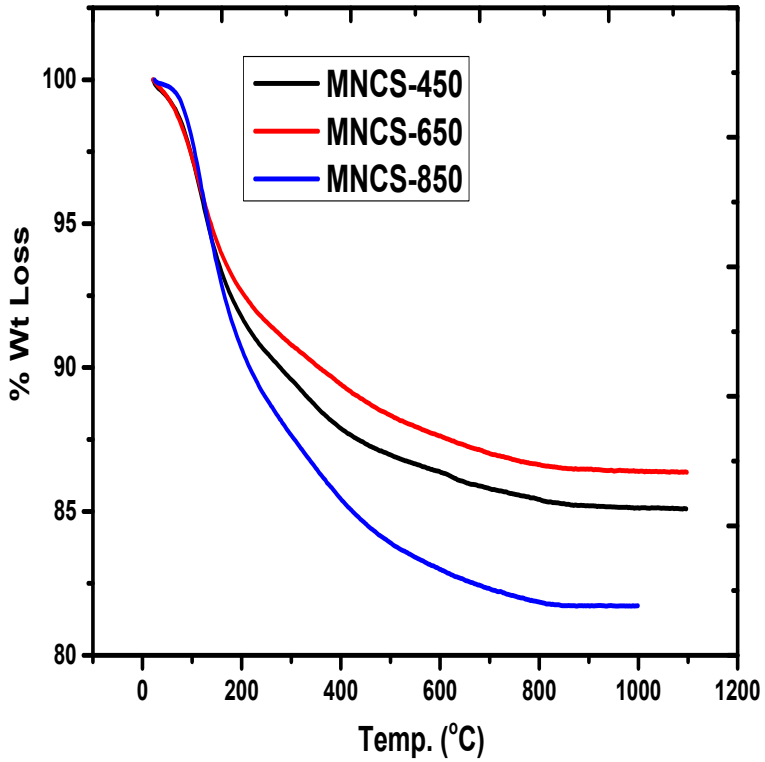


*Figure S1: TGA plots for MNCS-450, MNCS-650 and MNCS-850.*

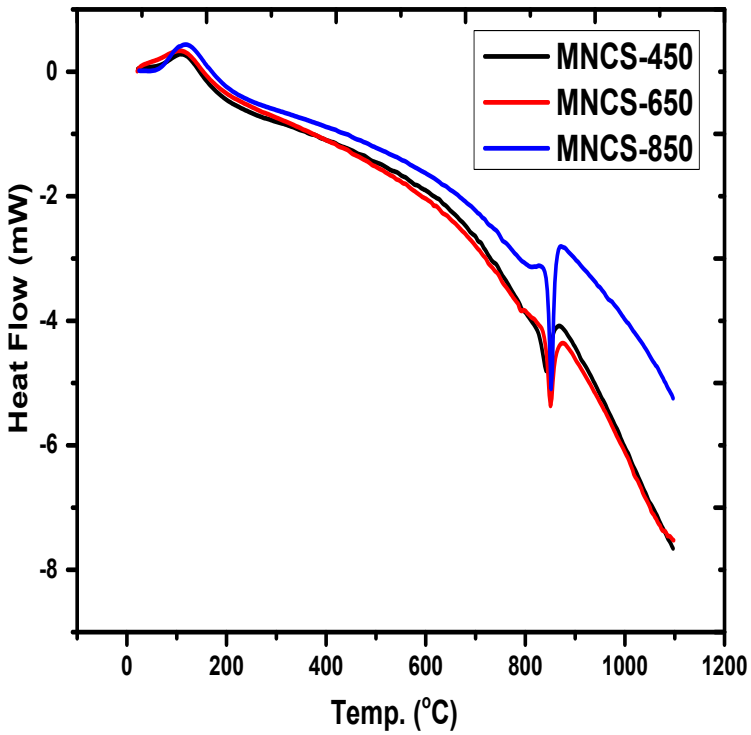


*Figure S2: DSC plots for MNCS-450, MNCS-650 and MNCS-850.*

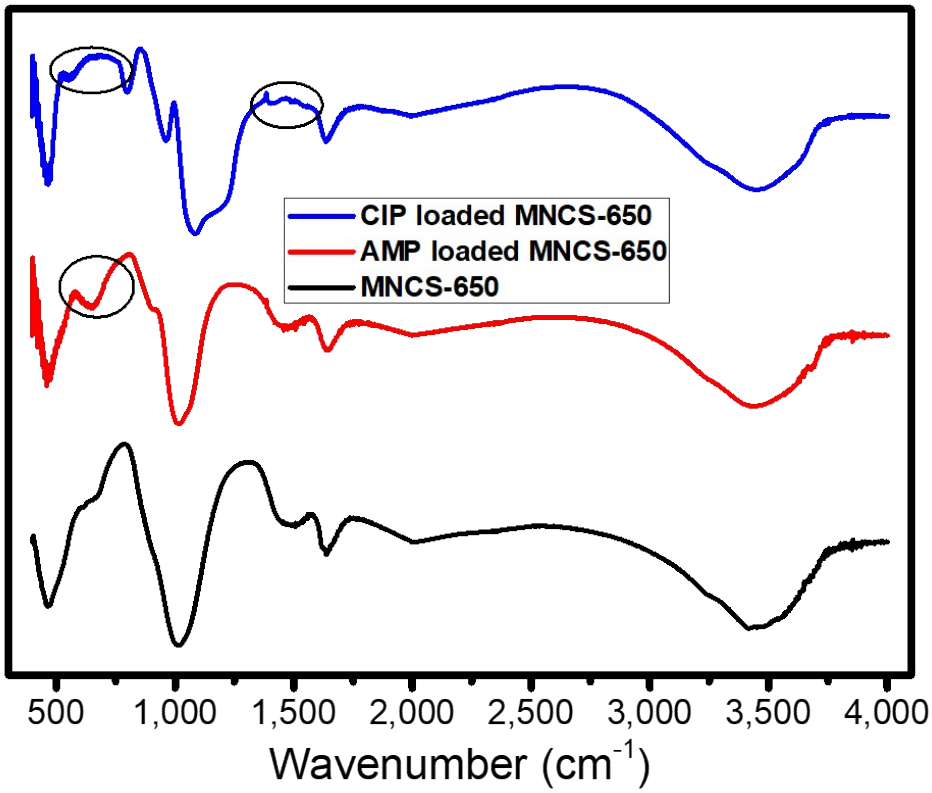


*Figure S3: FTIR spectra for MNCS-650, AMP loaded- MNCS-650and CIP loaded MNCS-650.*