



GEMaC

Groupe d'Étude
de la Matière Condensée

OXIDE HETEROSTRUCTURE WITH 10^5 % ELECTRORESISTANCE AT ROOM TEMPERATURE

par Joseph Scola, GEMaC - Seminar given at American Physical Society, march
meeting in Los Angeles

Jeudi 19 avril 2018

à 14h

Bâtiment Fermat

salle 4109

45 avenue des Etats-Unis

78035 Versailles cedex

`/**<!-- /* Font Definitions */@font-face {font-family:Arial; panose-1:2 11 6 4 2 2 2 2 4;
 mso-font-charset:0; mso-generic-font-family:auto; mso-font-pitch:variable; mso-font-
 signature:-536859905 -1073711037 9 0 511 0;}@font-face {font-family:"Cambria Math";
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 pitch:variable; mso-font-signature:-536870145 1107305727 0 0 415 0;}@font-face {font-
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 auto; mso-font-pitch:variable; mso-font-signature:-520092929 1073786111 9 0 415 0;} /*
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 mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font:minor-bidi; mso-ansi-
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 WordSection1;}@page WordSection2 {size:596.0pt 842.0pt; margin:49.0pt 51.0pt 14.0pt
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 1791491579 18 0 131231 0;}@font-face {font-family:"Cambria Math"; panose-1:2 4 5 3 5
 4 6 3 2 4; mso-font-charset:0; mso-generic-font-family:auto; mso-font-pitch:variable; mso-
 font-signature:-536870145 1107305727 0 0 415 0;}@font-face {font-family:Cambria;
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 pitch:variable; mso-font-signature:-536870145 1073743103 0 0 415 0;} /* Style
 Definitions */p.MsoNormal, li.MsoNormal, div.MsoNormal {mso-style-unhide:no; mso-`

style-qformat:yes; mso-style-parent:""; margin:0cm; margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:11.0pt; font-family:Cambria; mso-ascii-font-family: Cambria; mso-ascii-theme-font:minor-latin; mso-fareast-font-family:Cambria; mso-fareast-theme-font:minor-latin; mso-hansi-font-family:Cambria; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font:minor-bidi; mso-fareast-language:EN-US;}.MsoChpDefault {mso-style-type:export-only; mso-default-props:yes; font-size:11.0pt; mso-ansi-font-size:11.0pt; mso-bidi-font-size:11.0pt; font-family: Cambria; mso-ascii-font-family:Cambria; mso-ascii-theme-font:minor-latin; mso-fareast-font-family:"ＭＳ 明朝"; mso-fareast-theme-font:minor-fareast; mso-hansi-font-family:Cambria; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font:minor-bidi; mso-ansi-language:EN-GB; mso-fareast-language:JA;}@page WordSection1 {size:612.0pt 792.0pt; margin:70.85pt 70.85pt 70.85pt 70.85pt; mso-header-margin:36.0pt; mso-footer-margin:36.0pt; mso-paper-source:0;}div.WordSection1 {page:WordSection1;}-->/**/**/<!-- /* Font Definitions */@font-face {font-family:Arial; panose-1:2 11 6 4 2 2 2 2 4; mso-font-charset:0; mso-generic-font-family:auto; mso-font-pitch:variable; mso-font-signature:-536859905 -1073711037 9 0 511 0;}@font-face {font-family:"ＭＳ 明朝"; mso-font-charset:78; mso-generic-font-family:auto; mso-font-pitch:variable; mso-font-signature:-536870145 1791491579 18 0 131231 0;}@font-face {font-family:"ＭＳ 明朝"; mso-font-charset:78; mso-generic-font-family:auto; mso-font-pitch:variable; mso-font-signature:-536870145 1791491579 18 0 131231 0;}@font-face {font-family:Cambria; panose-1:2 4 5 3 5 4 6 3 2 4; mso-font-charset:0; mso-generic-font-family:auto; mso-font-pitch:variable; mso-font-signature:-536870145 1073743103 0 0 415 0;} /* Style Definitions */p.MsoNormal, li.MsoNormal, div.MsoNormal {mso-style-unhide:no; mso-style-qformat:yes; mso-style-parent:""; margin:0cm; margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:11.0pt; font-family:Cambria; mso-ascii-font-family:Cambria; mso-ascii-theme-font:minor-latin; mso-fareast-font-family: Cambria; mso-fareast-theme-font:minor-latin; mso-hansi-font-family:Cambria; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font: minor-bidi; mso-fareast-language:EN-US;}.MsoChpDefault {mso-style-type:export-only; mso-default-props:yes; font-size:11.0pt; mso-ansi-font-size:11.0pt; mso-bidi-font-size:11.0 pt; font-family:Cambria; mso-ascii-font-family:Cambria; mso-ascii-theme-font:minor-latin; mso-fareast-font-family:"ＭＳ 明朝"; mso-fareast-theme-font: minor-fareast; mso-hansi-font-family:Cambria; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font:minor-bidi; mso-ansi-language: EN-GB; mso-fareast-language:JA;}@page WordSection1 {size:612.0pt 792.0pt; margin: 70.85pt 70.85pt 70.85pt 70.85pt; mso-header-margin:36.0pt; mso-footer-margin:36.0pt; mso-paper-source:0;}div.WordSection1 {page:WordSection1;}-->/**/

Many strongly correlated electron systems host a metal-insulator transition (MIT). The possibility to trigger it with moderate external stimuli has drawn a lot of attention on these materials. Several ways have been put forward to trigger the MIT (electrical pulses, 2D confinement, heating, ionic electromigration) but the application of the phenomenon in devices is limited by the fact the transition temperature is often imposed by the system. We present a heterostructure of strongly correlated oxides whose resistance ranges from 2 k under a 2 V direct polarisation to 2 M under a 2 V inverse polarisation at room temperature. The mechanism of the transition is ascribed to the modification of the global conductivity as the chemical composition on both sides of the interfaces of the heterostructure is changed upon ionic migration induced by the external electric field. The conductivities of the metallic and insulating states depend on the temperature in such a way that the electroresistance is increased by a factor 10 at 10 K. The resistance switch is reversible at any temperature. We will discuss the growth conditions of the heterostructure and detail the electrical states in direct and inverse polarisations. The possible integration in devices will be considered too.