

Fibra ottica biorassorbibile microstrutturata per il rilascio di fluidi, in particolare farmaci, e la trasmissione di luce

Original

Fibra ottica biorassorbibile microstrutturata per il rilascio di fluidi, in particolare farmaci, e la trasmissione di luce / Milanese, Daniel; Janner, Davide; Pugliese, Diego; Boetti, NADIA GIOVANNA; Ceci-Ginistrelli, Edoardo. - (2018).

Availability:

This version is available at: 11583/2854379 since: 2020-12-02T14:37:45Z

Publisher:

Published

DOI:

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)



MINISTERO DELLO SVILUPPO ECONOMICO
DIREZIONE GENERALE PER LA LOTTA ALLA CONTRAFFAZIONE
UFFICIO ITALIANO BREVETTI E MARCHI

DOMANDA DI INVENZIONE NUMERO	102018000021559
Data Deposito	31/12/2018
Data Pubblicazione	01/07/2020

Classifiche IPC

Titolo

Fibra ottica biorisorbibile microstrutturata per il rilascio di fluidi, in particolare farmaci, e la trasmissione di luce

D& \$&&+!\$\$ X]. Dc`j]HMB]W[X] Hcf]bc Y-g]h hc`G dYf]cfYA Uf]c`6cY`U

µa ž dYf`UXXi ffY`c`dfYy UFY i b`Zi]Xcz`Wta dfYbXYbHY i b`a UYf]UY`Wob`cgg]X]`X]
: cgZfczA U[bYg]cz7UV]czY`Wbi bUdYfX]HJch]W]a Ugg]a UX]`&&X6#a Yrfc`a]g fUU
a YX]UbHY`U HMB]W`WMHUU` i H]`mLbXc` i bU gcf[YbHY`X]`i W`Ugr` U YbHY i bU
i b[\YmU`X`bXU`X]`*`'`ba`ei`UbXc`U`ZVfU`,,`X]gdcg]U`UX`i b`fU`[[`c`X]`Wfj`U`h`fUX]
)`%\$W`"

HUY`ZVfU`ch]W`WobgYbHY`X]`fYU]mLHY`X]gdcg]Hj`]`a`i`H`Z`bn]cbU]`]b`[`fUXc`X]
a`]g`fUY`UX`YgYa`d]c`dfcdf]Mf`ch]WY`X]`HYgg`H]`a`YX]UbHY`UMdd]Ua`Ybrc`Wob`
gdYHfcg]Wd]c`ch]W/`Udd]MUY`U`gdYHfcg]Wd]U`X]`Zi`cfYg]MbnU`dYf`X]U`bcg]MUY`
`f]bgcf[`YbnUX]`dUhc`c[`JY`ei`U]`h`a`cf]ZUFYf]cg]Wf]cg]`c`g]U]`X]`]bZ]Ua`a`U]cbY`cWY/
%\$`a`]g`fUY`U`HYa`dYU`h`fU`cWY`U`U`di`bHU`c`i`b[c`U`ZVfU`a`YX]UbHY``f]H]`mnc`X]
fY]W]`X]`6fU`[[`fYU]mLH]`bY`U`ZVfU`gYgg]U`f]Ug]MUY`cW]a`YbHY`a`YX]M]bU]`z`U`YbH]
X]`WobfUgr`c`gdcg]bnY`Zchcg]b]g]V]`mLbH]/`UHj`UFY`Wob`U`i`W`gdcg]bnY`Zchcg]b]g]V]`
i`H]`mLHY`dYf`U`HYfUd]U`ZchX]b]Ua`]WY`a`cb]hcfUY`c`g]Uhc`XY`U`HYfUd]U`YZZH`i`UFYz`
[`fU]Y`U`f]Y`U`H]fUgd]U`Ybn]U`bY`U`fY[`]cbY`XY`j`]M]bc`i`J`z`U`gYf]`]mLh]cbY`X]`HYgg`H]
%`c`HYfUd]U`ZchX]b]Ua`]W]a`YX]UbHY`]ffU`[[`Ua`Ybrc`Wob`gcf[`YbH]`i`a`]bcg]U`U`YbH]
i`b[\YmY`X`bXU`XY`UbWY`]bZf]cf]`U`(\$\$`ba`" `bZU]z`U`ZVfU`bY`U`g`U`Wta`d]cg]n]cbY`
VUgr`dfYg]bHU`i`b`WYZZ]M]bHY`X]`UggcfV]a`Ybrc`]bZf]cfY`c`i`[i`UY`U`%W`!%`UX`i`bU
i`b[\YmU`X`bXU`X]`&&\$`ba`" `b`ei`Ygr`a`cXc`,,`d]cg]V]Y`Yg]i`]fY`Y["`UbU]g]
gdYHfcg]Wd]WYX]Zi`cfYg]MbnU`

&\$`-bc`fYz]U`Y`ZVfU`dfYg]bHU`dfYg]U]cb]`ch]WY`Vi`cbY`UX`i`b`fU`[[`c`X]`Wfj`U`h`fUX]`%\$`
W`z`Wta`dU]V]Y`Wob`Y`WobX]n]cb]`X]`i`H]`mnc`d]-`Wta`i`b]`WY`dfYj`YXcbc`UX`Yg]`]
f]Ug]Uc`X]`ZUfa`U]V]c`gdcg]bnY`fU]M]U]b]b]`bY`g]HcfY`XY`Y`UbU]g]`a`YX]WY`-`b`
dU]H]W`UFYz`cW]ffY`bch]U`Y`WY]b`HU`Y`g]HcfY`Y`ZVfY`ch]WY`dYf]`f]Ug]Uc`XY]ZUfa`U]V]
bcb]g`dYfUbc]`a`YzdfYz]f]V]a`YbHYz]bcb]g`dYfUbc]`&a`X]`i`b[\YmU`

&`G]WobXc`i`bU`Zcfa`U`dfYZf]H]X]`fYU]mLh]cbYz`U`ZVfU`ch]W`dfYg]bHU`i`b`fU`[[`c`X]
Wfj`U`h`fUa`]b]a`c`dU]`UX`Ua`Ybc`&`j`c`HY]`X]Ua`Yrfc`Yg]Yfbc`XY`U`ZVfU`gYgg]`HUY`
fU`[[`c`X]`Wfj`U`h`fU`[`U]b]h]g]W`U`a`U]dc`U]cbY`g]bn]U`Y]W]gg]`]`f]g]W]`X]`fch]i`fUXU`
dU]HY`Y["`XY`dYfg]bUY`a`YX]W`ei`UbXc`U`ZVfU`j`]MbY`a`U]dc`U]U`]b`h`HY`Y`ZUg]
XY`f]Udd]M]h]cbY`g`X]`i`b`dU]YbHY`"

'`\$`G]WobXc`i`bU`Zcfa`UX]`fYU]mLh]cbY`dfYZf]H]UXY`U`dfYg]bHY]`bj`Ybn]cbY`Y`dYfWob]U]`

D& \$&&+H\$& X]. Dc`j]Hm]W[X]Hcf]bcY-g]h hc`G dYf]cfYA Uf]c`6cY`U

a c`Uf]`XY]`Wg]h Ybh`XY`Uz]VfUch]W gcbc`dUf]`U`cgg]Xc`X]: cg]zfc`(\$, \$ /cgg]Xc` X]`7UV]c`!)!)i /cgg]Xc`X]`A U[by]gc`!)!)i /cgg]Xc`X]`G]M]c`\$%\$ /cgg]X]`X]`GcX]c]z Dch]gg]c]z @]h]c`c`Uf]c`a YfU`c`UW]bc]Hff]c]g]`Y`X]`6cfc`]b`dYf]Vbh]UY`a c`UFY` f]gd]Yh]j`Ua`Ybh`bcb`g`dYf]cfY`U`\$`YX`U`%\$`dYf`ch]Yb]Yf]i`bUc`d]-`XY`Y`g]i`Ybh`)` WfU]Hf]g]WY]Z]g]WY#a`Ym]b]WY[f]U]h]YU`Uf]YU]m]L]h]cb]Y]b`hcf]Y]X]Z]U]h`fU`

T _g [°C]	400 + 500
T _s [°C]	580 + 720
T _i [°C]	430 + 530
CTE [10 ⁻⁶ °C ⁻¹]	11 + 14
E [GPa]	40 + 60

=b`dUf]W`UFYz`f]cgg]Xc`X]`7UV]c`zcf]b]g]W`i`b`dUf]W`UFY`Wb]h]M]h`U`U` V]c]W]a`dU]V]`]h`WY`j`]Yb]Y`]bc`h]Y`zcf]b]h`XU`f]U`[i]b]U`X]`Uf]`cgg]X]`X]`a`YfU]` UW]bc]Hff]c]g]`W]a`Y]`Dch]gg]c]z]`GcX]c`Y]`@]h]c`=bc`h]Yz`Uj`Uf]U]h]cb]Y]XY`f]cgg]Xc`X]` %\$` A U[by]gc]a`dU]U]g`~`Uj`Yc]V]h]X]X]gg]c`i`n]cb]Y`

G]W]b]Xc`i`bU`zcf]a`U`X]`f]YU]m]L]h]cb]Y`df]YZ]f]H]U]XY`U`df]Y]g]b]h]`]b]j`Yb]n]cb]Yz`„`]bc`h]Y` df]Y]g]b]h]`cgg]Xc`X]`G]f]c]b]n]c`]b`i`bU`ei`U]h]h](`a c`UFY`bcb`g`dYf]cfY`U`)i`dYf`]b]W]a`Ybh]Yf]`f]X]W]X]f]Z]U]h]cb]Y]Y]U]b]W]Y]b]Xi`ff]Yz]c]Y`b]W]g]g]U]c]zi`b`W]h]c`[f]U]Xc`X]` V]c]U]h]j`]h`”

%` G]W]b]Xc`i`bU`zcf]a`U]X]`f]YU]m]L]h]cb]Y`df]YZ]f]H]U]XY`U`df]Y]g]b]h]`]b]j`Yb]n]cb]Yz`U]Z]V]f]U]ch]W] W]a`df]Y]b]XY`i`bUc`d]-`U]b]a`Y]b]h]f]b]Y`f]X]Y]h]Y`bi`W]c`W]f]Yc`bcb`W]j`Y`U]Ybh`X]U]a`Y]f]c` W]a`df]Y]g]c`Z]U`\$`%`±a`Y`&`a`a`YX`i`b`a`U]b]Y`c`W]j`c`U]Ybh`X]U]a`Y]f]c`W]a`df]Y]g]c`Z]U`&\$` ±a`Y`-`a`a`z`]b`W]`~`U`W]j]h`dYf`j`Y]W]U]f]Y]`Zi]Xc`„`f]YU]m]L]U]b]Y`a`U]b]Y`c`”`@]U` dYf]V]bh]UY`X]`cgg]Xc`X]`A U[by]gc`„`a`U[[]cf]Y`b]Y`a`U]b]Y`c`f]gd]Y]h]c`U`bi`W]c`]b`

&\$` a`c]Xc`W]Y`f]X]W]X]f]Z]U]h]cb]Y]XY`bi`W]c`f]g`h]Y]g]g]f]Y`a`U[[]cf]Y]f]gd]Y]h]c`U]ei`Y`c`XY` a`U]b]Y`c`”`5`h]Y`j`U]f]U]h]cb]`W]a`dc]g]n]cb]U]`g]c]b]c`dc]g]V]j]`dYf`ch]Y]b]Y]f]Y`U`b]W]g]g]U]U` X]Z]Y]f]b]n]U]X]`]b]X]W]X]f]Z]U]h]cb]Y`dYf`~`U]f]YU]m]L]h]cb]Y]X]i`bU]Z]V]f]U]b`[f]U]Xc`X]`[i]X]U]f]Y` YZ]V]Y]b]h]Y`a`Ybh]Y`]`g]f]b]U]`i`a`]bc]g]”`=b`ei`Y]g]c`a`c]Xc`]`g]f]b]U]Y`i`a`]bc]g]c`j`]Yb]Y` j`Y]W]U]h]c]d]-`YZ]W]W]a`Ybh]Y`b]Y`bi`W]c`”

&` =bc`h]Yz`]bi`W]j`dc]g]c]b]c`Y]g]g]f]Y`U`a`Ybc`Xi`Y`Y`U]Y]f]Y`i`bU`W]a`dc]g]n]cb]Y`X]j`Y]f]g]U`Z]U` `c]f]c`”` G]W]b]Xc`i`bU`zcf]a`U`df]YZ]f]H]U]X]`f]YU]m]L]h]cb]Yz`U]g`dYf]Z]V]Y]XY`U]Z]V]f]U]ch]W]„`f]j`Y]g]f]H]U` X]i`bc`g]b]c`c`g]f]U]h]c`U`h]U]g]g]a`V]U]h]c`Y]g]Y]f]b]U]a`Ybh]Y`Y`#`c`b]Y`W]b]U]Y`X]`U]X]i`n]cb]Y`”

D& \$8&+15\$ X]. Dc]HMB]W[X] Hcf]bc Y-g]h hc'G dYf]cfYA Uf]c'6cY`U

HUY' gfUrc' Zcfa Urc' XU Ybh]k' a c`W&`UF]` WY' UKYf]gUbc' U`U g dYfZ]M]Y' j Yffc]U ,,`
Wg]h]rc' XU a c`W&`Y WY' W&a V]Ubc']` WfUHYfY' XY`U g dYfZ]M]Y' XU]XfcZcV]W` U
]XfcZ]]W`c j]M] Yfg]UgW&bXUXY' h]dc'X]` a c`W&`U]a d]Y[UUY'XY`U W&a dcg]n]cbY'
gdY]Z]W' XY' j Yffc' i g]rc'" E i Yg]U dcg]M]]k' X] j Uf]UfY' `Y' dfcdf]Yf' g dYfZ]M]U]`
)` a YX]UbY'Zi bn]cbU]mLh]cbY'XY' X]gdcg]h]j c'a i `h]Zi bn]cbUY' W&bgYbY'X]` W&bfc`UFY'
W&b' a U[]cf' dfW]g]cbY']` a c]]a Ybrc' XY' Zi]Xc' bY' W&bUY'" 5` h]rc' c' X]` Yg]a d]c']`
W&bUY']bhYfbc' X]` i bU' Z]VfU' ch]W' a i `h]Zi bn]cbUY' di' ` Ygg]fY' Zi bn]cbU]mLh]c'
a YX]UbY'i b'g]b[c`c' gfUrc' U' hcUg]a VUrc' X]` C`MUKY]!Hf]W&fcg]`Ubc' WY' W&a V]U`U
g dYfZ]M]Y'XY' X]gdcg]h]j c' W&bZfYbXc`Y]XfcZcV]M]k'" I bX]gdcg]h]j c' g]Z]Urc' f]` U]M]U' i b'
%\$` Z]fa U&`UK' Yg]' Fcg]U' Vb[UU]b' a Ub]YFU' d]` `Yb]U' Y' W&bfc`UfU' f]gd]Yrc' UK' i b'
X]gdcg]h]j c' WY' bcb' `U' g V]rc' fUY' hfU]Ua YbrcZ' U' a Yb]UbXc' W&g' bch]j c'a YbY'
`NZZ]W]UHYfU]Yi H]WXY' dfc]cW`c'X]` hfU]Ua Ybrc'"

GW&bXc' i bU'Zcfa UdfYZf]HUX]`fYU]mLh]cbY'Z`U W&a dcg]n]cbY'XY' j Yffc' ,,` fUY'WY`U
Z]VfU'ch]W'gddcfU`U' dfYgg]cbY'X]` i bU' dcf]U]U'UhfU] Yfgc']` W&bUY'X]`%\$\$`μ`#` `dYf`
%` i bU' g]n]cbY' hfU]j Yfg]U'XY' W&bUY'X]`%a` a &`" HUY' dfYgg]cbY' ,,` UK' Yg]a d]c' ei Y`U
Udd']M]U' a Ubi Ua YbY'fUa]HY' i bU'g]f]b[UW`Y[U]U'Zi]X]W&a YbY'U`U'Z]VfU'ch]W`
GW&bXc' i bU'Zcfa UdfYZf]HUX]`fYU]mLh]cbY'Z` ,,` dcg]M]Y'UW&dd]UfY']b' Z]b]k' Z]U' cfc'
i bU'd' i fU]k' X]` Z]VfY'gW&bXc']` dUfU[fU]`dfYWX]Yb]h'"

8\$` BREVE DESCRIZIONE DELLE FIGURE

@U' dfYg]bY']bj Ybn]cbY' j Yff{ `XYg]M]HU' ei]` X]` g]i]rc' a YX]UbY' UW&bY' Zcfa Y' X]`
fYU]mLh]cbY' dfYZf]HY'Z' Zc]b]HY' U' h]rc'c' Yg]a d]Z]M]h]j c' Y' bcb' `]a]HU]j cZ' W&b'
f]Zf]a Ybrc' U]` X]g]i b]`U`Y[U]h]" E i Yg]`X]g]i b]`]` i gfUbc' X]Z]fYb]` U]gd]Yh]` YX' Yg]a d]`
XY`U' dfYg]bY']bj Ybn]cbY' YZ'Xc] Y' Udd]cdf]UrcZ' gf]i H]i fY'Z' W&a dcbYb]h]Z' a UHYf]U]`Y#`c`
&` Y'Ya Yb]g]a]]]b' X]Z]fYb]` Z]i fY'g]bcb']bX]M]H]`XU'bi a Yf]X]`f]Zf]a Ybrc'g]a]]`
`b'dUf]W'UfY'`

! `U :] [i fU %] ` i gfU `Y' g]n]cb]` hfU]j Yfg]U]` UZ' VZ' WZ' XZ' YZ' Z' X]` Yg]a d]`
fYU]mLh]j]` UHYf]U]j]` Y' bcb' `]a]HU]j]` X]` i bU' Z]VfU' ch]W' a]M]c]gf]i H]i fU]U
gW&bXc'`UdfYg]bY']bj Ybn]cbY'/

' \$` ! @U:] [i fU & U Z] ` i gfU Z] b' g]b]g]c' cfUf]cZ' `N]b[c`c' X]` W&b]Urc' X]` i bU' [cW]U X]`

D& \$8&+1\$S' X]. Dc`j]fWb]W[X] Hcf]bc Y-g]h hc`G dYf]cfYA Uf]c'6cY`U

UWf U X]g]`UHU Y`U hcdc`c[]U YX`]` g] bUY` fUa]HY` A]MfcgWd]U U : cfnU
5hca]W dYf` i bU g dYfZ]WY` d]UbU X]` j Yfc` W]V]c!Zcg]hc` gWbXc` i bU
Wa dcg]n]cbY` X]` YgYa d]c` f]gdYHj] La YbHY` g]bnU Y` Wob`U g]`Ub]mLh]cbYz`]Y`
Zi bn]cbU]mLh]cbY/

)` ! @Y` :] [i fY` ' U Y` ' V` a cgfUbc` f]gdYHj] La YbHY`]` [fU]W] XY` W]YZ]W]YbHY` X]`
UggcV]a Ybhc` XY` UdchYbnU` i a]bcgU]b` Zi bn]cbY` XY` U` i b[\YmUX]cbXUY` U
dchYbnU` i a]bcgUX]i g]W]b` X]j YfgY` g]n]cb] XY` UZ]VfUfci UKfU]t` Y`

! @U` :] [i fU` (`]` i g]fU` i bU dfcj U Wa dUfU]j U XY` f]` Ub]c` Wa i `U]j c` X]` i b`
ZUfa UW` bY` HYa dc` dYf` i bU Z]VfU ch]W g]`Ub]mLh]cbY`]Y` Zi bn]cbU]mLh]cbY` bcb`
%\$` g]`Ub]mLh]cbY`]Y` bcb` Zi bn]cbU]mLh]cbY`

DESCRIZIONE DETTAGLIATA DELL'INVENZIONE

b` :] [i fU` %gcbc`]` i g]fUY` UWbY` UHYfU]j Y bcb`]a]HU]j Y` X]` g]n]cb]` fU]j YfgU]` X]`
i bU Z]VfU ch]W a]Mfcgfi Hh fUU V]cf]UggcV]W]Y` % dYf`]` fU]c]c]f]c` X]` `i W` Y` X]`
ZUfa U]Z]fUa]HY` i bUW]j]f` `cb[]h X]bUY` &` HFUa]HY` UW]j]f` c` WbUY` &` ,, dccg]W]YU
%` gWbXU XY` Y` Udd`]W]h]cb]` f]` Ub]W]Y` c` fUW] []YfY` g]g]bnY` cf[]b]WY` Wa Y` W` i `Yz`
Y#c` VUHf]z` Y#c` g]g]bnY` W]a]WY` Wa Y` ZUfa U]Y` fU[]b]h` "≡` WbUY` &` dfYg]b]U` i bU
X]a Ybg]cbY` a]b]a U` X]` V]W` &\$` μa` YX` ,,` fUY` XU` fYbXYfY` `U` Z]VfU` X]` :] [i fU` %U`
a]Mfcgfi Hh fUU` @U` Z]VfU` ch]W` %` ,,`]bc` fY`]b` [fUXc` X]` fU]c]c]f]c]fY` `i W`
XU` Ń` fU]j` c` Y]hc` U` Ń` bZUfcggc` dYf` Yg] [i]fYz` gWbXc` YgYa d]` bcb` `]a]HU]j]z`
&\$` g]Yf]`]mLh]cbYz` UbU]g]` gdYHf]cgWd]WY` X]` Zi cfYg]Mbn]z` U]h]j U]h]cbY` X]` g]g]bnY`
Zch]g]bg]W]`]mLh]cbY` ["dYf` HYfU]j] Zch]X]bUa]WY` X]` h` a` cf]c` UKYg]cbY` Zch]W]a]W]X]`
HYgg` H`"

≡ j Yfc` W]V]c!Zcg]hc` g]` ,,` X]a cgfUhc` Ygg]fY` i b` a` UHY]UY` UKU]hc` UK` ch]YbYfY` i b` Vi` cb`
Wa dfca Yggc` ZU]V]cf]UggcV]W]`]f` Y` Y` W]UHYf]g]WY` a` YW]b]WY` Y` Z]g]WY` b` W]gg]f]Y`
&` dYf` fU]mLh]cbY` i b` WbXch]c` ZYgg]W]` Yz` a` Ub]dc` U]Y` XU` dYf]gcbUY` a` YX]W` Y` j` Yfg]H]Y`
dYf` U]fU]a]gg]cbY` X]i bc` gdYHf]c` Ua d]c` X]` Z]Yei` YbnY` X]` i` W]j]g]W]` Y` Y` bcb` j]g]W]` Y`
GWbXc` i b` YgYa d]c` fU]mLh]cbY` c` XY` U` dfYg]b]Y`]bj` Ybn]cbYz` `U` Z]VfU` ch]W`
a]Mfcgfi Hh fUU` Wa dfYbXYz`]b` dYf` W]h] U]` a` c` U]z`)\$` X]` D&C,ž` %&`)` X]` B U&Cž` '\$` X]`
7UCž` X]` G]C,ž` X]` A [C` Y&`)` X]` 6&C` dYf` ch]YbYfY` Y` g] [i Yb] W]UHYf]g]WY` .

D& \$\$\$+\$\$\$ X]. Dc`]HMB]W[X] Hcf]bc Y-g]h hc G dYf]cfYA Uf]c'6cY`U

T_g [°C]	400 ÷ 500
T_x [°C]	580 ÷ 720
T_s [°C]	430 ÷ 530
CTE [10^{-6} °C ⁻¹]	11 ÷ 14
E [GPa]	40 ÷ 60

=b VM].

T_g „`UHYa dYFUi fUX] fUbg]n]cbYj YrfcgU/

T_x „`UHYa dYFUi fUX] V]ghU`]mLh]cbY/

)` T_s „`UHYa dYFUi fUX] fUa a c``]a Ybhc/

7H9 „`] WYZZ]V]bHYX]X]UUh]cbYHYfa]W/

E „`]`a cXi `cYUbj]W`c`a cXi `cX]Mti b[``

=bc`fYZ`U Z]VfU ch]W a]Mcgfi Hh fUUG]WbXc`U dYf]WXYbHY`Wa dcg]n]cbY dfYgYbHU

%\$` i b`WYZZ]V]bHYX]`UggcfV]a Ybhc`]bZf]cfY`c`i [i UY`U`%W`!%UX`i bU`i b[\`YmUX]X`bXU

X]`&\$\$\$`ba ``E i YgU dfcdf]Yf`di` `YggfY`a cX]Z]WfU`fUa]HY`N[U`[]i bHU XY]`gY[i Ybh`

cg]X]. B U.CZ`@]CZ?`&CZH]C`Z7i C`YNbC`fYbXYbXc`U Z]VfUd]-`c`a Ybc`fUgdUfYbHY`U

HUY`i b[\`YmUX]X`bXU`5`h]c`c`X]`YgYa d]c`N[U`[]i bHU X]`i bU ei Ub]H`X]`H]C`&

g dYf]cfYU`N[U`U a YbHU]`WYZZ]V]bHYX]`UggcfV]a Ybhc`U&\$\$\$`ba`dcf]UbXc`c`Uj Ucf]`

%` a U[[cf]`c`i [i U]`X]`)`W`!%`@U dcg]V]`]H`X]`a cX]Z]WfY`N[UggcfV]a Ybhc`U`HUY`

`i b[\`YmUX]X`bXU` \U`Wa`Y`Wbgy[i YbHU ei Y`U`X]`gdcg]fY`U`gc`[]U`]bZf]cfY`X]`

fUgdUfYbHU`X`UbXc`U`dcgg]V]`]H`X]`i`g]fY`U`Z]VfU`ch]W`a`]Mcgfi`Hh`fUUG]W`a`Y`i`b`

Z]`f`c`gdYHfUY`5`X`YgYa d]czi bU`Z]VfU`a`i`h]bi`Wc`]b`W]i`b`bi`Wc`fUgdcfHU`U`i`W`

I`J`W`b`i`bUfYU]j`U`Wa`dcg]n]cbY`YX`i`b`U`f`c`bi`Wc`fUW]`Y`i`W`X]`Zi`cfYg]MbnU`

&\$` UggcfV]bXc`U`i`W`i`fUj`c`YHU`Y`Uj]UbXc`dUgg]fY`U`i`b[\`YmUX]X`bXU`U`W]`gbc`

Zi`cfYg]Mbh]`]HYgg`h]V]c`c[]M]WY]h]d]W`a`YbHY`„`UX`i`bU`i`b[\`YmUX]X`bXU`d]-`Y`Y`U`U`

fUX`Yg`)`\$\$`ba`E`HUY`U`f`c`bi`Wc`dYf]gYbHU`i`b]N[U`fY]cfY`Wa`dcg]n]cbYz]`b`dUf]W`UfY`

Wa`dYf]cfY`U`c`\$)``a`c`i` `]b`U`[[]i`bHU`U`[]`U`H]`cg]X]`gdcfU`

]bX]W]H]`

&` =bc`fYZ`U`Z]VfU`X]`j`Yrfc`g]WbXc`N[U`YgYa d]c`„`f]UggcfV]V]Y`]b`WbX]n]cb]`Z]g]c`c[]WY`

O`+`s7`Y`d`c`X]`+`(`Q`W`b`i`b`U`ggc`X]`X]ggc`i`n]cbY`X]`V]f]W`&(`±a`#[]cfbc`ei`UbXc`U`

X]`a`Yb]cbY`a`Ugg]a`U`XY`U`g]n]cbY`fUj`Yfg]Y`„`X]`&\$\$\$`±a`YX`„`fUgdUfYbHY`U`

D& \$\$\$+H\$ \$ X]. Dc`j]Wb]W[X]Hcf]bcY-g]h hc'G dYf]cfYA Uf]c'6cY`U

i b[\YmY XfcbXUWa dfYg'ZU &) \$Y &\$\$ ba "I b'Yg/a d]c'X] [Yca Yf]UchYb]M]Y
gM]bXc`U:][i fU%U,, X] &&\$ ±a `X]X]La Yf]c YgYfbc Y%\$ ±a `X]X]La Yf]c XY WbUY
&"D]-]b [YbYfUYZ`Y WfUhf]g]WY`Wb]WY gcbc`chYbi fY'j Uf]UbXc`UWa dcg]n]cbY
dYf`chYbYfY YZM]h] ch]M]Y#c` WfUhf]g]WY a YWb]WY XYg]XYfU] Ybfc`] gM]i Yb]h
) `ja]h]f]b'dYfWb]h U]a c`Uf]k`(\$, \$ X]D&C)ž\$' \$ X]B U&Cž\$%\$ X]'6&C.ž!)!)i X]
7UCž\$%\$ `X]G]C&ž!)!)i `X]'A [Cž\$%\$ `G]C&ž\$' \$ `@]Cž\$' \$ `?&C"á]bc`fY
dceg]M]Y dfYj YXYfY i `Hf]cf]` cgg]X]]b`ei Ub]h]k` j Uf]U]Y a U]bZf]cf] U`' \$ `]b`
dYfWb]h UY'a c`UfY"

5X`Yg/a d]cž,, dceg]M]Y dfYj YXYfY i bUei Ub]h]k` X]`cgg]Xc`X]G]fcbn]c`bcb`g dYf]cfY
%\$ U)i `dYf]b]W/a Yb]fY`f]b]X]W[X]f]Zf]h]cbYXY j Yf]c XY`bi W]c"

I `Hf]cf]`Wa dcg]n]cb]Yg/a d`Z]M]h] Y Y`bcb`ja]h]h] YgM]bXc`f]oj Ybn]cbY gcbc`f]b`
a c`i k`) \$D&C)ž' \$7UCž%\$) ?&Cž' `A [Cž' `G]C&ž&) `6&C' /cddi fY) \$D&C)ž' \$7UCž
%\$) `B U&Cž' `A [Cž' `G]C&ž&) `H]C&/cddi fY) \$D&C)ž' \$7UCž%\$) `B U&Cž' `A [Cž'`
6&C.ž &) `H]C&" DfYZf]M]a Yb]h]ž ei UbXc`f]gg]Xc`X] : cgg]cfc`g]M]bXY gch]c`]`) \$ `,,`

%` cddcf]h bc`]b]f]cXi ffY` c` U]M]Yg]M]Y []` cgg]X] X]` 6cfc` Y#c` G]]M]c" =bc`fYž i bU
j Uf]U]h]cbY X]`cgg]Xc`X] 7UV]c`,, Wa dYbg]U XU i b]f]ddcg]U j Uf]U]h]cbY X]`cgg]X] X]
A U [bYg]c Y#c` G]fcbn]c"

=bc`fYž `U Z]f]U ch]W fYU]m]U g]M]bXc``U Wa dcg]n]cbY`gcdfU]b]X]M]h] dfYg]b]U
i bUZYgg]M]h] fYU]h] Ua Yb]Y`Yj U]YX`U]U]U`Ua Ub]dc`U]h]cbY`c`U`f]dd`]M]h]cbY`

&\$` g` `Wf]dc`i a Ubc" C]W]f]fY`bch]fY`WY`U Z]f]U ch]W X]Y`f]oj Ybn]cbY`dfYg]b]U dYf]X]H]Y`
fYU]h] Ua Yb]Y`U]gg]U]b]WY`U gM]i]h]c`X] ZYgg]cb]" =b`d]U]h]W`Uf]Yž,, g]U]c`j Yf]Z]M]h]c`WY`
`U dYf]X]U]U]X`i bU`i b[\Ym]X]fcbXU]X]`*'' `ba`bcb`g dYfU] &&X6`dYf`a Yf]c`]b]YUfY`
X]` Z]f]U ei UbXc` gch]c]dcg]U U]X`i b`f]U []c`X]` Wf] U]i fU X]` %\$ W] " =bc`fYž Wb` `U
a YXY]a U]Wf] U]i fU`U dYf]X]U,,]b]Zf]cf]Y`c`i [i UYU%` X6`ei UbXc`a]g fU]U]X`i bU

&` i b[\Ym]X]fcbXU X]` %\$\$` ba " HU]` j Ucf] X]` dYf]X]H] f]U]dd]fYg]b]U]bc`i b` `ja]H]Y`
g dYf]cfY` WY` ,, j U]Xc` bY`Y` bi a Yf]cg]Y` Wb]Z] [i fU]h]cb]` dceg]M]]` XY`U g]h]cbY`
f]U]j Yf]g]Y`XY`U Z]f]U ch]W a]M]c]g]f]i H]i fU]U]g]M]bXc`f]oj Ybn]cbYž Wa Y]b]X]M]h]c`]b`
a cXc`bcb`ja]h]h]c`XU`Y:][i fY%U]Y` =bc`fYž]U]`dYf]X]H] gcbc`U]U]U]U`f]ja d]M]c`bY`
g]M]h]cfY` XY`Y` Ub]U]g]`a YX]WY`]b`W]`U`i b[\Ym]X]Y`U Z]f]U U`f]b]Yf]bc`XY` Wf]dc`

' \$ i a Ubc`bcb`g dYfU]`&a "

D& \$8&+15\$ X]. Dc`j]hWb]W`X] Hcf]bc Y-g]h hc`G dYf]cfYA Uf]c`6cY`U

GWbbXc`i bUj Uf]UbHY`XY`U dfYgYbHY`]bj Ybn]cbYz`U Z]VfU ch]W`%fi][i fY`%!XE`di ' ` Wfa dfYbXYfY`i b`bi WwC` Wfa dUhc`gpg]ubn]Ua YbHY`XYg]bUhc`U`UhfUga]gg]cbY`XY`U `i W`YX`i b`a UbHY`c` (`XYZ]bYbHY`]` WbUY` &`Y`]b[`cVUbHY`]` bi WwC` " " `≡` bi WwC` " ` dfYgYbHUi bUWfa dcg]n]cbY`gpg]ubn]Ua YbHY`ch]a]mLUdYf`UhfUga]gg]cbY`XY`U`i W`)` j]g]V]Y`Y#c` bcb`j]g]V]Y`Yz`U fUY` gWdcz`U dYfWbhi UY`X]` cgg]Xc`X]` a U[bYg]c`bY` bi WwC` " `," a U[[]cfY`X]` ei Y`U bY`a UbHY`c` (ž UK`YgYa d]c`a U[[]cfY`XY`)i " " D]-]b` [YbYfUYz`]` bi WwC` YX`]` a UbHY`c` \Ubcb`Ybfla V]` Wfa dcg]n]cb]` U VUg]Y`X]` cgg]Xc`X]` : cgZfcz`7UV]c`YA U[bYg]c`a U`Y`dYfWbhi U]`Y#c`i `hf]cf]` cgg]X]` ZUei Y`]`Y`YbW]]b` dfYWX`Ybn]Ugbc`X]`ZZfYb]`c`dcgg]bc`Ygg]fY`U[[]i bh`"5 bUc[Ua YbHYz`]b`Wgc`X]` Z]VfY` a i `h]`bi Wwcz`Y`f]g]Yh]j`Y` Wfa dcg]n]cb]` gbc`U`VUg]Y`X]` cgg]Xc`X]` : cgZfcz`7UV]c`Y` A U[bYg]c`a U`Y`dYfWbhi U]`Y#c`i `hf]cf]` cgg]X]` ZUei Y`]`Y`YbW]]b` dfYWX`Ybn]Ugbc` X]`ZZfYb]`c`dcgg]bc`Ygg]fY`U[[]i bh`"

@Y`UHf]bU]j`Y`fYU]mL]j`Y`XY`Y` :][i fY`%W`%X`g`f]Zf]gWbc`f]g]Yh]j`Ua YbHY`UX`i bU WbbZ][i fU]cbY`XY` bi WwC` WbWb]f]W]f]g]Yh]c`U`WbUY`&`Wb`]` bi WwC` WY`V]`WbXU`]` WbUYz`YX`U`UdfYgYbn]Ug]UX]i bUd`i fU]h` X]`bi W]`WYX]i bUd`i fU]h` X]`WbU]"

@Y`UHf]bU]j`Y`fYU]mL]j`Y`XY`Y` :][i fY`%Y`%Z`g`f]Zf]gWbc`U`WbZ][i fU]cb]`X]`Z]VfUU` W]g]U`c`Zchb]W`]b`W]`U`i Wj`]YbY`[i]XU]a YX]UbHY`WbZ]bUa Ybhc`ch]Ybi hc`[fU]Y` UX`i b`UffU]b[]Ua Ybhc`cddcf]i bc`XY]a]M]c`WbU`)"HU]a]M]c`WbU]`dcgg]bc`Ygg]fY`X]` j`Yfc`fUX`Yg]j`Yfc`X]`bi WwC` Wfa`Y` h]Ygg]YbXc`V]U]Wb`a]M]c`WbUY`)`fYU]mL]j`Y`Wb` i bUWfa dcg]n]cbY`X]j`Yfc`X]j`Yfg]Ucddi`fY]i`ch]`Wfa`Y]`a]M]c`WbUY`&`"=a]M]c`WbU]`)`WY`gbc`j`i`ch]`dcgg]bc`Ygg]fY`i`g]h]`UbWY`dYf`]`f]U]W]c`X]`]`ei`X]`"i`b`WbUY`X]` f]U]W]c` X]X]W]c` &`di`'`Ygg]fY`dfY]]gc`c`fY`U]`a]M]c`WbU]`)` Wfa`Y`]bX]W]c` bY`W]UHf]bU]j`UfYU]mL]j`UXY`U` :][i fU`Z`"

DfYZf]V]`a`YbHYz`U`Z]VfU`ch]W`%g`]YbY`fYU]mLU]h]Ua]HY`i`bU]hcf]Y`X]`Z]`U]i`fUU`dU]h]fY` XU`i`bc`c`d]-`h]`V]`X]`j`Yfc``W]`c`c`d]Yb]`fYU]mL]j`Wb``U`hW]W]XY`U`W`U]z` XY`W]g]fi`g]cbY`c`XY`UXY`dcg]n]cbY`W]a]W]b`Z]bY`X]j`U]cfY`"

E`i`UbXc`U`Z]VfU`ch]W`Wfa`dfYbXY`i`b`bi`WwC`YX`i`b`a`UbHY`cz`U`Z]`bn]cbY`X]`[i]XU`ch]W`,"d]-`dYfZcfa`UbHY`Y`U`dYfX]U]a`U]g]a`Ua`]g`fU]U`Wb`fU[[]c`X]`W]f]`U]i`fUX]`%\$` W]`Y``i`W`Wb``i`b[\`Ym]U`X]W]bXU`dU]`U`*`" `ba`bcb`g`dYfU`]`+`X6`#`a`Yfc`" `≡`

'`\$`W]f]g]cbXYbHY`j`UcfY`X]`dYfX]U]ei`UbXc`U`fUX]U]h]cbY`\`U]i`bU`i`b[\`Ym]U`X]W]bXU`dU]`

D& \$\$\$+H\$\$ X]. Dc`j]Wb]W`X] Hcf]bc Y-g]h hc`G dYf]cfYA Uf]c`6cY`U

U% \$\$ba ,, X]' `X6#a Yffc"

DFYZf]V]`a YbHŽ `U g dYfZ]V]Y` XY`U Z]VFU ch]W %ž]b` dUf]W`UFY` XY` WbUY` &ž ,,`
Z bn]cbU]mLU dYf`WbHfc``UFY`UdfcWXi fUX] f]Ug]c`XY` ``ei]XczY["`XY`ZUfa UW`
@Uz bn]cbU]mLh]cbY`di ' `YggYf`cdYfU dYf`XYdcg]HUFY`c i bc`gfUhc`]XfcZ]c`c i bc`
)` gfUhc`]XfcZcVc`]b`a cXc`X]dYbXYbHY`XU`Y`WfUHYf]g]WYXY` ``ei]Xc`XUf]Ug]UFY`"

GWbXc`i b`YgYa d]c`fYU]mLHj` cz`U`Z]VFU ch]W`a]Mfcgfi`hi`fU`U`%Wb`dYfWbhi`U]`
a`c`Uf]`X]`)\$`D&C)ž`'\$`7UCž`%)`B`U&Cž`'`A`[`Cž`'`G&Cž`&)`6&C`,,`gLU`fYU]mLU`
gWbXc`c`gWYa`U`X]`:]`[i`fU`%U`Wb`i`b`X]La`Yffc`YgYfbc`X]`&&\$`-`'`a`YX`i`b`
X]La`Yffc`]bHYfbc`X]`%\$`-*`a`"

%\$` DYf`XYHYfa`]bUFY`]'`a`cXi`c`X]`Mci`b[`Y`U`fYg]gYbnU`XY`U`Z]VFU`%ž`]`HYgh]X]`HfU]cbY`
gcbc`gLU]`YgY[i`]h`]`Ja`d]Y[UbXc`i`bU`a`UW]bU`X]`dfcj`U`i`bj`YfgUY`gWbXc`U`
a`YrcXc`c`[U`g]UbXUX`5GHA`7%)`+`C[b]`g]b[c`c`Wa`d]cbY`,,`g]Uhc`]bW`Uhc`g`
]b[i`YHY`X]`a`cbH[]`c`H[]`UHY`XU`WfcbY`gch]Y`dYf`ZU]HUFY`]`dcg]n]cbLa`Ybhc`YX]`
Zgg[]`[c`U`U`a`UW]bU`dYf`]`HYgh`a`Wb]M]Y`Hi`HY`Y`dfcj`Y`X]`HfU]cbY`gcbc`gLUY`

%` fYU]mLUY`]b`WbX]n]cb]`La`V]YbU]`fH`1`&`š7ž`a`]X]H`FYUHj`U`1`)\$`E`Gcbc`gLU]`
chYbi`H]j`Ucf]`a`YX]X]`(\$;`DUX]`a`cXi`c`X]`Mci`b[`Y`&)`\$`A`DUX]`Wf]W`X]`fchh`fUž`
Wb[fi`Yb]Wb`i`b`fU[]`c`X]`Wf]`U`i`fUa`]b]a`c`Ufchh`fUX]`&)`W`"

@U`WbU]H`X]`[i`]XU[]`c`XY`U`i`W`XU`dUfHY`XY`U`Z]VFU`ch]W`%,,`gLU`j`Ui`fU`
`Ub]UbXc`i`bU`i`W`UgYf`j`]g]Y`fii`b[`\YmU`XfcbXU`X]`(\$ž)`&Y*)`\$`ba`E`UHFU`Yfgc`
&\$` i`bU`g]n]cbY`X]`i`b[`\YmU`dUf]`U`%a`XY`U`Z]VFU`a`]Mfcgfi`hi`fU`U`%`@U`ei`U]H`XY`Y`
ZUW`X]`YgfYa`]H`XY`Y`Z]VFY`,,`gLU`j`Ui`fU`a`YX]UbHY`a`]MfcgWd]U`ch]W`XY`U`
f]gdYHj`U`g]n]cbY`HfUj`YfgUY``á`gLU`UbWY`gWLU`i`bU`gYf]Y`X]`]a`a`U[]b]`]b`
dfcgg]a`]H`XY`Y`ZUW`X]`YgfYa`]H`i`H]mLbXc`U`i`W`UgYf`fcgg]U`**`\$`ba`X]`
i`b[`\YmU`XfcbXU`@U`dYfX]HU`XY`U`Z]VFU`W]U`,,`gLU`g]a`U`U`U`i`bU`i`b[`\YmU`
&` XfcbXU`X]`**`\$`ba`a`YX]UbHY`]'`a`YrcXc`X]`Wf]VUW`i`H]mLbXc`i`bU`gcf[`YbHY`X]cXc`
`UgYf`U`Z]VFU`d][`H]YX`a`i`]a`cXUY`fE`:@8!`**`\$`%\$G`"≡`j`UcfY`X]`UHYbi`U]cbY`,,`g]Uhc`
W`Uhc`a`YX]UbHY`Z]H]b[]`]bYUFY`XY`XU]`gdYf]a`YbU]`dfYg]`U`X]j`YfgY`i`b[`\YmY`
XY`U`Z]VFU`f]`[i`fU`V`"

Gcbc`gLUY`]bc`fY`YgY[i`]HY`U`di`]n]U`XY`U`g`dYfZ]V]Y`Y`fU]Hj`U]cbY`XY`j`Yffc`
'`\$` a`YX]UbHY`gcb]W]n]cbY`]b`i`bU`gc`i`n]cbY`VUj]WB`<`C`<`Ž`<`&C&`Ž`<`&C`dYf`%\$`a`]bi`H]U`

'`\$` a`YX]UbHY`gcb]W]n]cbY`]b`i`bU`gc`i`n]cbY`VUj]WB`<`C`<`Ž`<`&C&`Ž`<`&C`dYf`%\$`a`]bi`H]U`

'`\$` a`YX]UbHY`gcb]W]n]cbY`]b`i`bU`gc`i`n]cbY`VUj]WB`<`C`<`Ž`<`&C&`Ž`<`&C`dYf`%\$`a`]bi`H]U`

D& \$8&+H\$ X]. Dc`j]HwBj]W`X] Hcf]bc Y-g]h hc`G dYf]cfYA Uf]c`6cY`U

HYa dYfUhi fU`La V]YbHY" @U`g]`Ub]mLh]cbY`XY`j`Yfrc`,,`g]HUU`chYbi`HU`Ja`a`Yf[`YbXc`]`
Wla`d]cbY]b`i`bUgc`i`n]cbY`X]`%\$` ``X]`CHG]b`&` `a` `X]`Yg]bc`dYf`%cfU`≡`Wla`d]cbY`,,`
g]Hrc`]bZ]bY`UwMfU`La`YbHY`f]g]M]UwM`Urc`Wobz]b`cfX]bYz`Yg]bcz`UwMrcbY`YX`Yfubc`c`-b`
)` dUf]Hw`UfYz`]`fU`HLa`Ybhc`gcdfU`]bX]M]rc`,,`g]Hrc`Yg]f]i`]hc`UbWY`g` ``UgfY`X]`j`Yfrc`
)` d`UbUf]`dYf`Yg]f]i`]fY`a`]g`fY`XY`f]ub[c`c`X]`WobH]rc`U`Z]bY`X]`WfUHYf]mLHY`]`
a`cbcg]f]Hrc`X]`g]`Ubc`g` ``U`g`dYfZ]M]Y" @Y`a`]g`fU]cb]`fU`La`]HY`A`]M]cg]Wd]U`U`:`cfnU`
5]hca`]M]g]bc`g]HY`fYU]mLHY`i`h]`mLbXc`i`bU`gcbXUX]`g]`]M]c`5`_]nta`U]b`a`cXU]H`U`
WobH]rc`df]a`UY`Xcdc`U`dfcW]Xi`fUX]`g]`Ub]mLh]cbY" @Y`a`]g`fU]cb]`XY`f]ub[c`c`X]`
WobH]rc`g]bc`g]HY`Yg]f]i`]HY`g` `X]`i`b`Wla`d]cbY`g]`Ub]mLhrc`YX`i`bc`bcb`g]`Ub]mLhrc`
%\$` f]i]i`fU`&L`HY`a`]g`fU]cb]`dYf`g`dYfZ]M]Y" g]bc`g]HY`YZYH`i`UY`g` `X]j`Yf]g]`di`bh]`XY`
Wla`d]cbYV]W`UfY"

-b]n]Ua`YbHYz`i`b`HYgh`Wla`V]bUrc`X]`f]U]M]c`X]`i`b`Zi`cfcZfc`f]gch]c]U]bUrc`X]`
Zi`cfYg]M]bL`Y`U`g`UYW]M]U]cbY`g]bc`g]H]`YZYH`i`U]`Wob`U`Z]M]FU`W]U`%g]WobXc`U`
Wla`d]cbY]g]gcdfU`]bX]M]U"5`ei`Yg]c`g]Wdcz]`f]U]M]c`Y`f]U]cbY`X]`[i`]XU`[[]c`XY`U`
%)`i`W`g]bc`g]H]`chYbi`h]`U`c`g]Yggc`HYa`dc`W`Y[`UbXc`Y`Z]M]FY`UX`i`bU`g]f]b[U`YX`
UwM]dd]UbXc`i`b`U]f]UX]cXc`U`U`Z]M]FU`W]U`XU`i`b`Urc`≡`Zi`cfcZfc`,,`g]Hrc`X]`i`]hc`]b`
UwM`UYX`,,`g]Hrc`YwM]Urc`i`h]`mLbXc`i`b`X]cXc`U]f]U`(\$)`ba`X]`i`b[\`YmU`X]M]bXU`
dfcXi`WobXc`i`bf]a`]gg]cbY`WobfU]U) &\$`ba`"@Ugc`i`n]cbY`a`UXfY`dYf`]HYgh]X]`f]U]M]c`
XY`Z]fa`UwM`,,`g]HUU`dfYdUfU]U`X]ggc`j`YbXc`Fcg]U`6Yb[U]U`]b`Yfubc`c`UX`i`bU`
&\$`WobWobfU]cbY`X]`-("a`A`"9b]f]La`W`Y`Z]M]FY`bcb`g]`Ub]mLhY`Y`g]`Ub]mLhU`g]bc`g]HY`
HU`]U]Y`]b`g]n]cb]`X]`&\$`a`a`f]i`c`i`a`Y`]bHYfbc`J`1`\$`%` `Lz]f]Ya`d]HY`Wob`Ugc`i`n]cbY`
dYf`]a`a`Yf]cbY`Y`]bZ]bY`Ygg]W]HY`g]Hrc`j`i`c]rc`U`(\$`s7`dYf`&(`cfY`dYf`]a`i`cj`YfY`]`
gc`j`YbHY"G`W]gg]j`La`YbHYz`dYf`HYg]UfY`]`Wla`dcf]La`Ybhc`X]`f]U]M]c`Z`Y`Z]M]FY`W]M]HY`
Wob`]`Z]fa`UwM`g]bc`g]HY`dcg]Y`]b`dfcj`YHY`9ddYbXcfZ`W]i`g]`WobHYbYbh]`%a` `X]`
&)`gc`i`n]cbY`HLa`dcbY`X]`Zcg]Urc`g]U]bc`f]D6G`Ud<`1`+("8i`f]UbHY`]HYgh`UHYa`dYfUhi`fU`,,`
g]HUU`W]g]U]bHYa`YbHY`a`UbHYbi`HU`"+s7`"8cdc`i`b`HYa`dc`X]`UH]Yg]U]b]n]UYX]`%a`]bi`hcz`
`U`gc`i`n]cbY`WobHYbYbHY`]`Z]fa`UwM`f]U]M]Urc`,,`g]HUU`dfY`Yj`U]U`XU`U`Z]M]FU`W]U`dYf`
`f]ub]U]g]`gd]YHf]cg]Wd]W]X]`Uggc]f]a`Ybhc`I`J`Y`ei`]bX]`gg]h]i`]HU`Wob`c`g]Yggc`j`c`i`a`Y`
X]`D6G`Z]Yg]W]@UdfcW]Xi`fU`,,`g]HUU`f]dYH`HU`UX`]bHYf]U`]X]`HYa`dc`Z]gg]Z]bc`U`f]U]M]c`
'`\$`Wla`d`Yrc`Y`dYf`V]U]M]b`di`bhc`g]bc`g]HY`dfYg]U`Ua`Ybc` ` `a`]g`fU]cb]" @U

D& \$8&+H\$ X]. Dc]hWb]W'X] Hcf]bc Y-g]h hc'G dYf]cfYA Uf]c'6cY`U

WobWobfUh]cbYXY`ZLfa Ua'f] Uj]Uhc`,, g'fUei]bX]'chYbi hU]bYfde`UbXc`UWfj UX]'
W]VfUh]cbYUddfcdf]UUF &2 '\$'---L'DYf`chYbYfY`UgWUHYa dcfUYWfUHYf]g]WXY`
dfcWggc`X]'f]Uj]c`dYf`Y`ZVfY`Wj`Y`bcb`g`Ub]mUHY`Y`g`Ub]mUHY`Z`XU]'gcbc`gUj`
UXUHU]'i`h`]mLbXc`U`X]g]f]M`n]cbY`X]'K`Y]M`YX`]'HYa dc`h]d]W`dYf`i`b`f]Uj]c`
)` Wai`U]j`c`XY`*`&'&`,, g'Uhc`YgfUdc`Uhc`XU`f]bYfde`U]cbY`"

GWobXc` `U`dfYg'bhY`]bj`Ybn]cbYz`,,`dccc]V]Y`fYU]mUfY`i`bU`ZVfU`ch]W`
a`M]c]g]fi`Hi`fU`U`V]gU`c`Zchcb]Wz`]'Y`]'b`W]`f]Z]h`[`i`]XU`bY`,,`chYbi`hc`XU`i`bU`
d`i`fU]h`X]'bi`WV]`Wj`]'dYf`WobfUhc`X]']bX]W`cddi`fY`dYf`U`WfU]cbY`X]'i`b`
b]UbX[`Ud]Zchcb]W`-b`hUY`Wgczi`bc`c`d]-`XY`]'g]Ygg]'bi`WV]`Wj`]'dccc]bc`z`b`YfY`XU`
%\$` WbUYX]'f]Uj]c`cj`j`Yfc`]'WbUY`&,,`V]WobXUhc`cddi`fY`,,`UX]UWobY`U`U]'bi`WV]`Wj`]'
YdfYg'bhU`i`b`X]Ua`Yfc`a`U`[]cfYX]hU]'bi`WV]`"

7cb`f]Zf]a`Ybhc`U`U`V]cf]Uggcf]V]M]`h`z`i`bU`ZVfU`U`V]gU`c`Zchcb]W` \U`dfYg'U]cb]'
gg]Ubn]Ua`YbY`]X]Yb]WY`UX`i`bU`Wff]g]cbX]YbY`ZVfU`gWobXc`Y`[`Yca`Yf]YX]`Z`[`i`fU`
%UdU]h`X]'dfcdf]Yh`XY`a`cX]'ch]M]`i`]XU]YX]Ua`Yfc`XY`WbUY`"

%` I`bU`ZVfU`a`M]c]g]fi`Hi`fU`U`V]gU`c`Zchcb]W` \U`dYfX]hY`X]'dchYbn`U`XY`U`fU]U]cbY`
Y`Yfca`U`[`bY]W`a`YX]Ua`YbY`a`U`[]cf]`g]U`XY`U`WobZ`[`i`fU]cbY`X]':`][`i`fU`%J`WYz`
g]dfU`h`hcz`XY`Y`WobZ`[`i`fU]cb]`Wob`bi`WVc`Y`a`UbY`c`XY`Y`Z`[`i`fY`%M`X`"

=b`a`Ub]YfU`UbUc`[`U`U`ei`Ubhc`XYg]M]h`c`g]dfUz`U`ZVfU`a`M]c]g]fi`Hi`fU`U`V]gU`c`
Zchcb]W`di`'`f]M]YfY`i`b`fU`Ua`Ybhc`g`dYfZ]U]Y`dYf`YggYfY`z`bn]cbU]mU`U`Yz`
&\$` g]fi`h`UbXc`]'`a`YXYg]a`c`a`Ww]ga`cz`dYfa`YhYfY`X]'f]Uj]UfY`]b`a`Ub]YfU`d]-`
Wobf`c`U`U`Y`Yb]i`U]'ZLfa`U]c`gg]UbnY`W]a`]WY`ei`U]'UX`Yg`U`[`Yb]`X]'WobfUjcz`
bUbc!V]gU`]'Y`bUbc!dU]h]W`Y`"

RIVENDICAZIONI

1. Fibra ottica di vetro biorisorbibile microstrutturata comprendente una composizione con ossido di Fosforo, ossido di Magnesio e ossido di Calcio tale da fornire, quando curvata con una curvatura di 10 cm, una perdita non superiore a 22 dB / m per una radiazione avente una lunghezza d'onda di 633 nm; e avere un canale longitudinale (2) avente un diametro tale da rilasciare e / o assorbire un liquido.
2. Fibra di vetro microstrutturata secondo la rivendicazione 1, in cui il canale (2) ha una sezione trasversale compresa tra $300 \mu\text{m}^2$ e 1 mm^2 .
3. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni 1 o 2, in cui la composizione è tale da sopportare la pressione di una portata attraverso il canale (2) di $100 \mu\text{l/h}$ per una sezione trasversale del canale di 1 mm^2 .
4. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni precedenti, in cui la composizione è tale che la perdita non è superiore a 15 dB / m per una radiazione avente una lunghezza d'onda di 1300 nm.
5. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni precedenti, in cui la composizione è tale che la velocità di dissoluzione a $\text{pH} = 7,4$ e $T = 37^\circ \text{C}$ è compresa tra $0,1$ e $20 \mu\text{m} / \text{giorno}$ per una fibra avente una dimensione di sezione trasversale massima di $200 \mu\text{m}^2$.
6. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni precedenti, in cui la composizione comprende inoltre un altro ossido di un metallo alcalino in una percentuale molare non superiore al 30% e / o ossido di Boro in una percentuale molare non superiore al 10% e / o Silice in una percentuale molare non superiore al 10%.
7. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni precedenti, in cui la composizione comprende inoltre ossido di stronzio in una percentuale molare non superiore al 5%.
8. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni precedenti, comprendente almeno un nucleo comprendente la composizione e avente un diametro compreso tra $0,1 \mu\text{m}$ e 2 mm ; e un rivestimento cavo comprendente la

composizione; inglobante l' almeno un nucleo; avente un diametro compreso tra 1 μm e 9 μm e in cui una percentuale molare di ossido di magnesio è maggiore nel rivestimento rispetto al nucleo.

- 5 9. Fibra di vetro microstrutturata secondo la rivendicazione 8, in cui l' almeno un nucleo comprende la composizione in modo tale che l'assorbimento non sia superiore a 1 cm^{-1} per una radiazione avente una lunghezza d'onda di 200 nm.
- 10 10. Fibra di vetro microstrutturata secondo la rivendicazione 9, in cui la fibra comprende un ulteriore nucleo avente la composizione ulteriormente comprendente ossido di Titanio in modo tale che l'assorbimento dell'ulteriore nucleo sia maggiore di 3 cm^{-1} per una radiazione con una lunghezza d'onda di 200 nm.
11. Fibra di vetro microstrutturata secondo la rivendicazione 8, in cui il nucleo è cavo e circonda il canale (2).
12. Fibra di vetro microstrutturata secondo una qualsiasi delle rivendicazioni precedenti, in cui la superficie è funzionalizzata per essere sia idrofoba che idrofila.

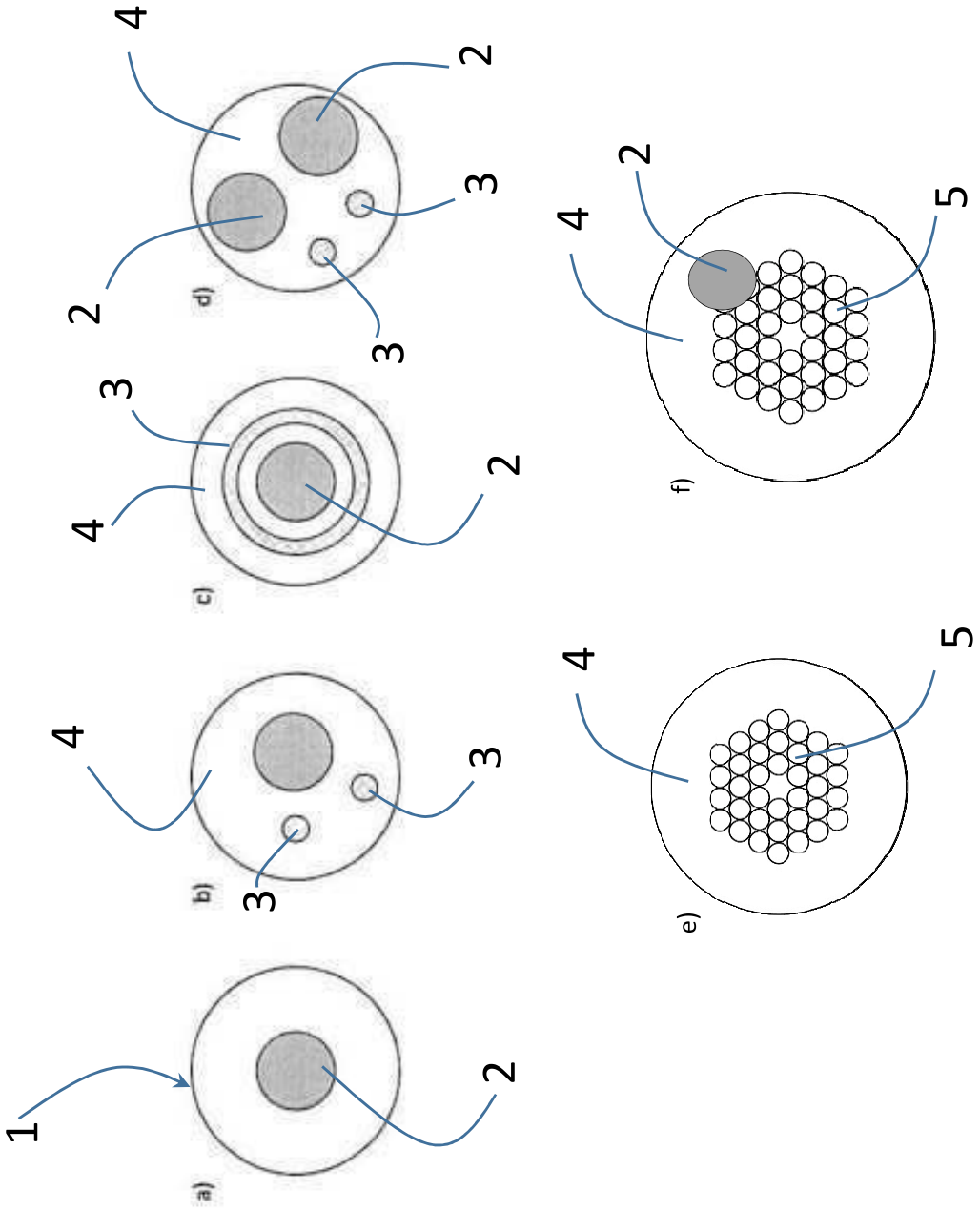


Fig. 1

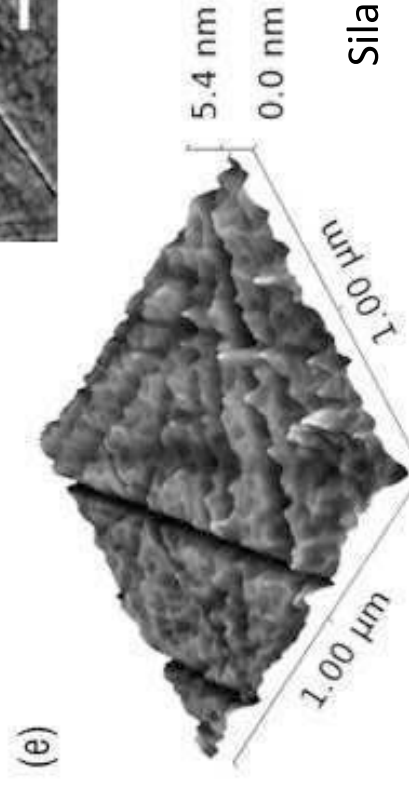
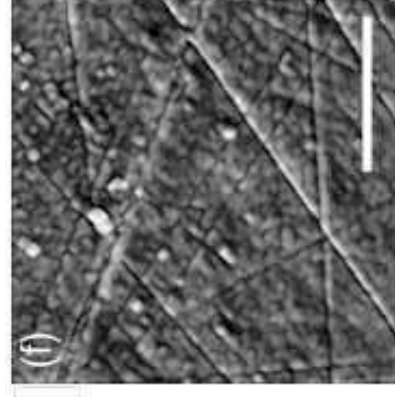
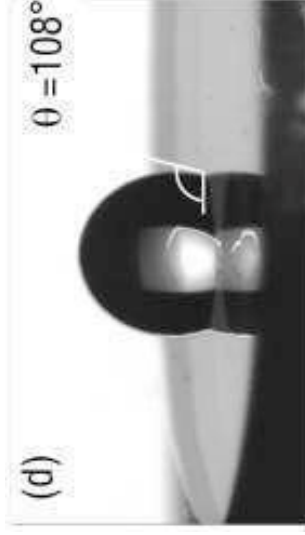
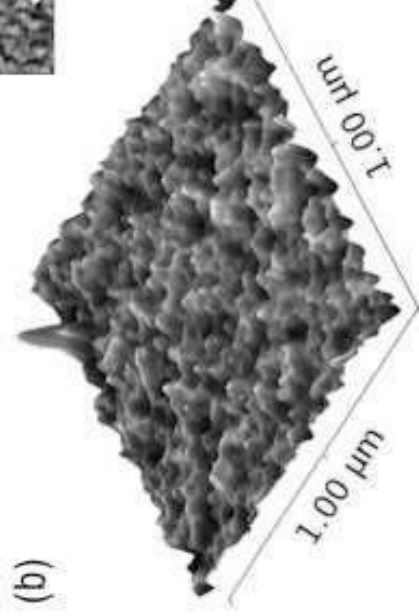
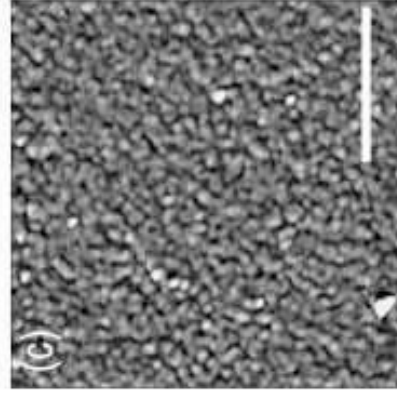
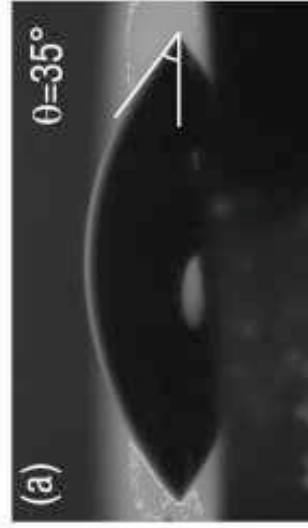


Fig. 2

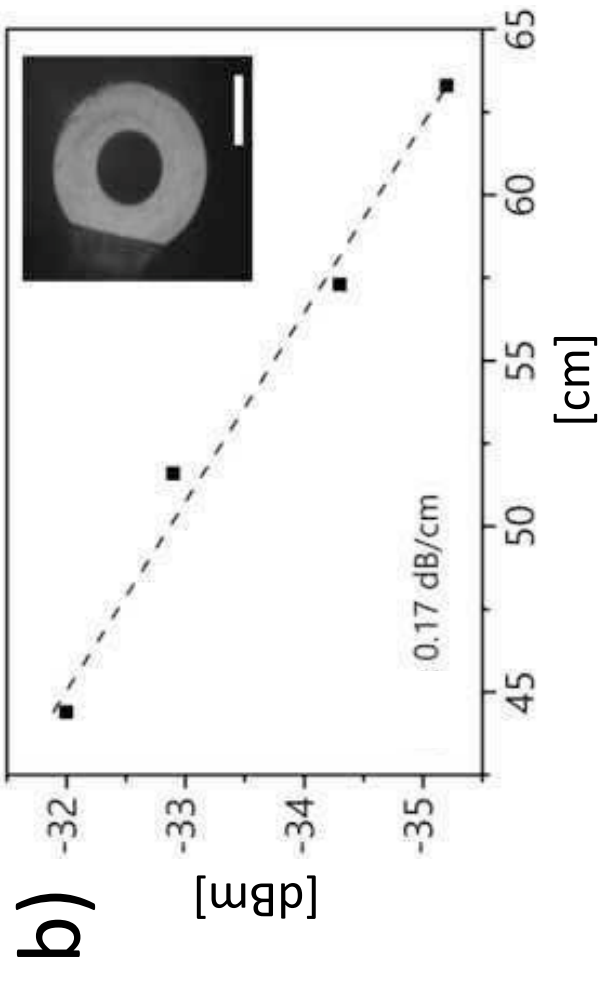
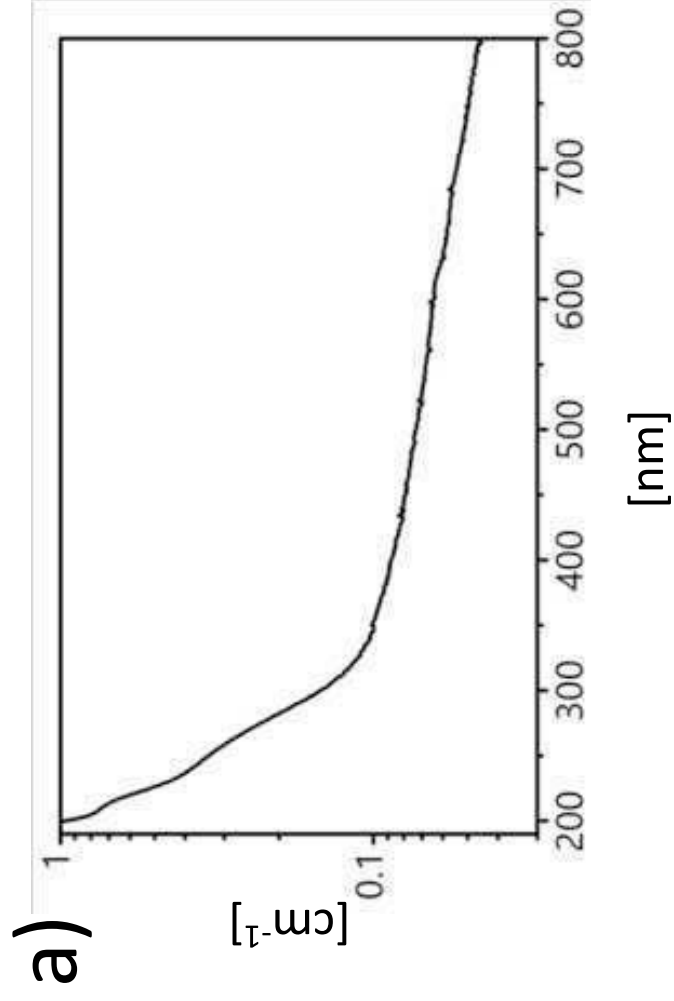


Fig. 3

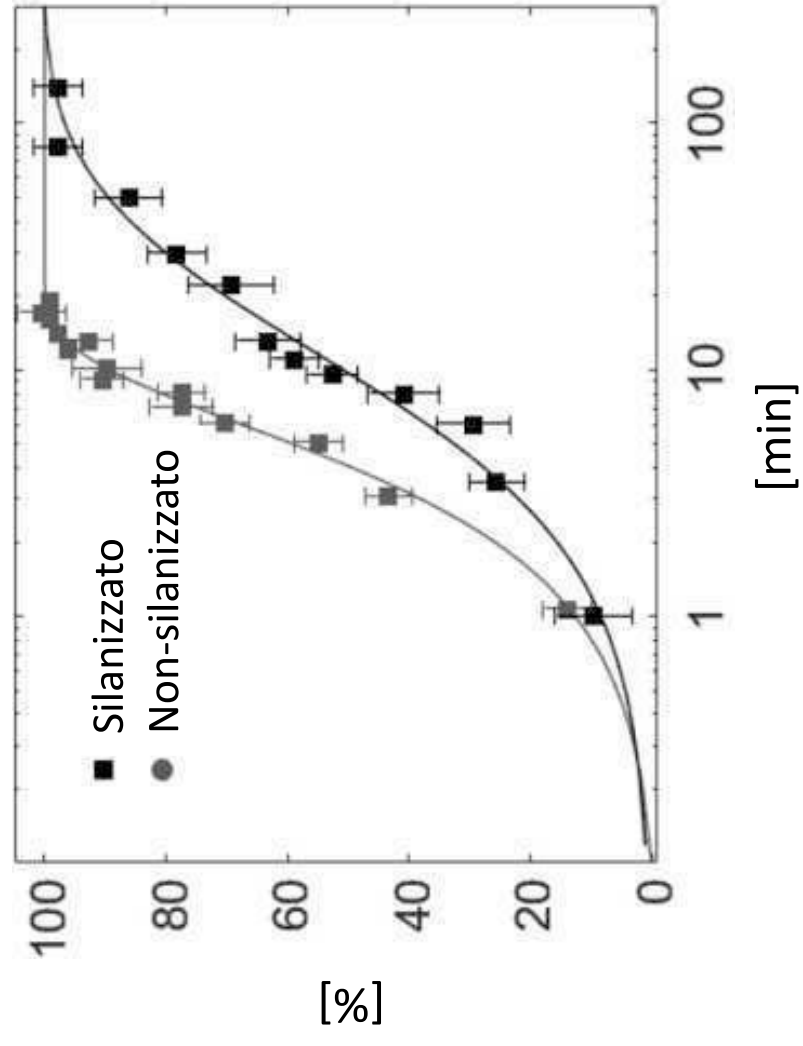


Fig. 4