SUPPLEMENTARY MATERIAL

Fig. 8 shows the near-linear relation between the maximum principal value of the plastic strains [%] in the Nerve Bundle Model and the speed impact values, v [m/s], used in the frontal head impacts of the Head Model. These results confirm the trends shown in Fig. 6, providing the equation for each case.

On the active fibre, Fibre #3, during 17.1% of applied elongation, the membrane peak is lower than $-40mV$ for all the bundle types, with the exception of the BBMY where the peak reaches $-29.2\ mV$, see Fig. 9 (a). Increasing the elongation up to 23.7 %, a voltage plateau of about $-25\ mV$ is reached in the SBMY and BBUN. In contrast, in the BBMY, the voltage plateau is about $-4.02\ mV$ at 32.3%, while it is equals to $-24.2\ mV$ at 49.7% in SBUN, see Fig.9 (a). In Fig. 9 (c), the voltage baseline is shifted to about $-24\ mV$ after 23.7% elongation in the SBMY, BBMY and BBUN, while in the SBUN case the same value is reached after 42.5% elongation. Only in the BBMY, the membrane peaks are distinct from the membrane baseline, see Fig. 9 (a) and (c). After elongation, the membrane voltage peaks vary between $-65\ mV$ and $-60\ mV$ in both the SBUN and SBMY for all strain values, see Fig. 9 (b). In contrast, in the BBMY, the peaks are about $-45\ mV$ for all strains, while, the voltage read in BBUN goes from $-62\ mV$ at 32.3 % strain, up to $-24\ mV$ at $42.5 - 49.7\%$, see Fig. 9 (b). A similar trend is found for the voltage baseline, see Fig. 9 (d).

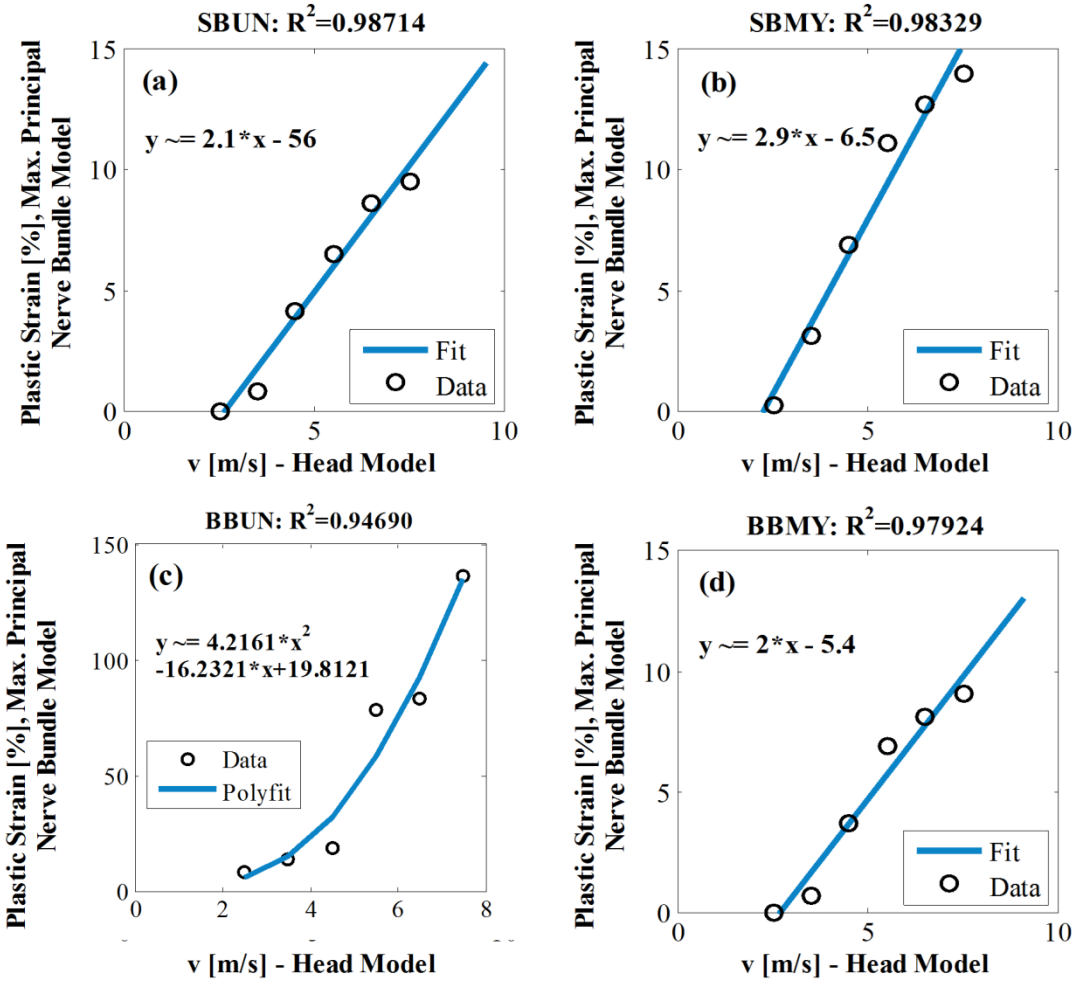

Fig. 8 *Variation in the maximum principal value of the plastic strains [%] in the Nerve Bundle Model, read at the nerve membrane, vs. the speed impact values, v [m/s], used in the frontal head impacts of the Head Model. Regression fits are also shown; the fits refer to SBUN, SBMY, BBUN and BBMY in (a) to (d), respectively.*

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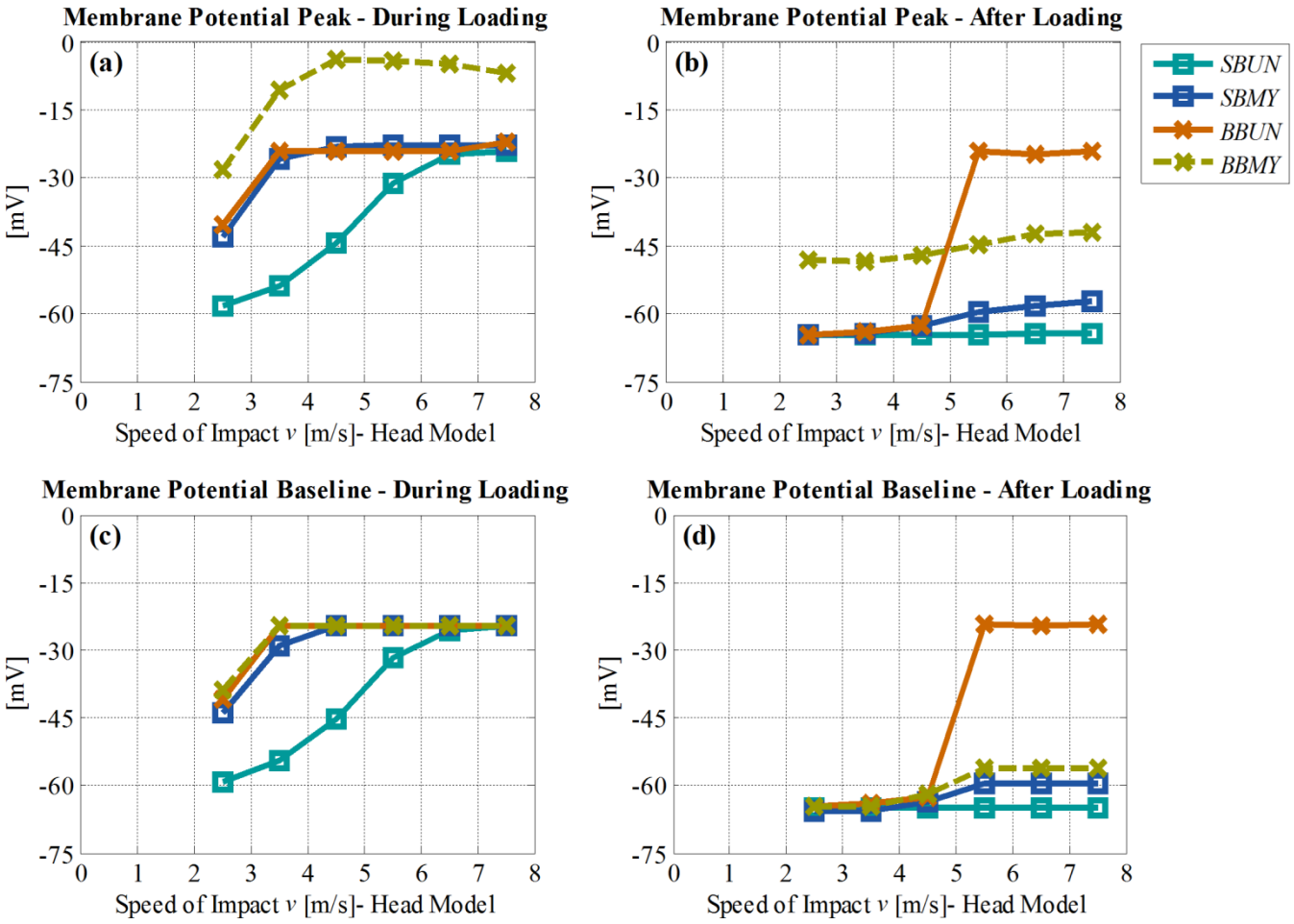

Fig. 9 *The membrane potential peak [mv], read at the nerve membrane, vs. the speed of impact values, v $[m/s]$ used in the Head Model; (a) and (c) show the potential values during elongation, while (b) and (d) show the potential values after elongation. On the top, (a) and (b), are for the membrane potential peak, read on Fibre#3. On the bottom, (c) and (d), are for the membrane baseline.*