

# Water-in-acid gel polymer electrolyte towards all-solid-state supercapacitors

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In this work, we coin the new term '*water-in-acid* electrolyte' for highly concentrated  $\text{H}_3\text{PO}_4$  with relatively less amount of water present in it. Concentrated  $\text{H}_3\text{PO}_4$  (15.1 M / 88 wt. % aqueous solution of  $\text{H}_3\text{PO}_4$  is used throughout this work) is immobilized in a polymer matrix for the preparation of a novel self-standing proton conducting GPE (*water-in-acid* GPE) with excellent mechanical stability and proton conductivity. The real-life application of this *water-in-acid* GPE film is then demonstrated by using it for the fabrication of an all-solid-state SC where polyaniline (PANI) is used as the active electrode material. It is envisaged that the reported *water-in-acid* GPE will be suitable for use along with other acid-stable electrode materials (carbon/metal oxides/conducting polymers) and can potentially replace the conventional quasi-solid-state GPEs in SCs.