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In recent years, significant attention has been paid to the development of micro-devices as innovative energy storage solutions. For instance micro-sensor networks such as sensors actuators or implantable medical devices require power densities and cyclability that are several orders of magnitude higher than those of conventional Lithium-Ion batteries. For such applications, Microsupercapacitors (MSCs), a developing novel class of micro/nanoscale power source are rising alternatives, and their integration "on-chip" could allow significant innovations to emerge.[1] Therefore, a great deal of attention has been focused on MSCs, for which large series of nanostructured active materials have been developed.

Following this trend, our work focuses on MSCs made of silicon nanotrees[2,3] functionalized by high-k dielectrics and transition metal oxides as new nanostructured materials to improve their performances. Here we deposit $NiCo_2O_4$[4] oxides particles synthetized by various facile and scale up inorganic processes such as oxalate route and electrodeposition. Oxides based on Ni and Co have been chosen for their promising performances, as $NiCoO_4$ nanowires electrodes were shown to exhibit a specific capacitance of 743 $F.g^{-1}$ at 1 $A.g^{-1}$ with excellent rate cycling stability (6.2% loss after 3000 cycles)[5]. We have also investigated the impact of the addition of a high-k dielectric layer, such as Al_2O_3 and HfO_2 as protective films on silicon nanotrees exhibiting outstanding cycling performances with more than 4 billion cycle stability within a potential window of 4V.

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