Nutrients enriched super absorbent polymers for the adsorption of water vapour

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In the last years agricultural achieved impressive results. The doubling of agricultural food production was accompanied by greater inputs of fertilizer, water, new crop strains and pesticides, and other technologies of the "Green Revolution". To meet the continuing demand for raw materials, developing countries now use more than 55 million tons of nitrogen fertilizers per year [1]. It is estimated that to reach adequate production of food for the growing population the external input of fertilizers will increase in the next years exponentially with negative impacts on sustainability and ecological principles [2].
Moreover, the uncontrolled release of large amounts of external nutrients have contributed to severe negative consequences (e.g., increased erosion, lower soil fertility, ground water and air pollution, rivers and lakes eutrophication, climate changes) [3]. In addition, water crisis is increasingly becoming a global problem with devastating consequences of, as evidenced by the recent drought experienced in Italy in the summer of 2022.
Among the most advanced materials developed to retain large quantities of water and fertilize the soil super absorbent polymers (SAPs), as potassium polyacryplated (K-PAs), occupy a special place for their unique features [4]. In fact, they are cheap, commercially available, non-toxic, harmless, non-polluting, and do not cause soil salinization [5].
However, to the best of our knowledges, the possibility of using K-PAs to recover water from industrial chimneys as vapor has never been studied. Similarly, nutrients-enriched K-PAs through modifications with recycled materials have never been developed.
In the present work we'll describe our attempts in the modification of commercial K-PAs by waste materials and we'll report the results obtained in their ability to adsorb water vapor.

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