

The invention provides compositions and systems comprising a carrier and an element. The carrier is a network of polymers insoluble in water comprising phenolic hydroxyl moieties, aliphatic hydroxyl moieties or a combination thereof. An association between the carrier and the element is labile in response to biological demand and the lability of the association in the presence of water is less than the lability of the association in response to biological demand. Also provided are methods of making such compositions and methods for delivering the element to an organism.